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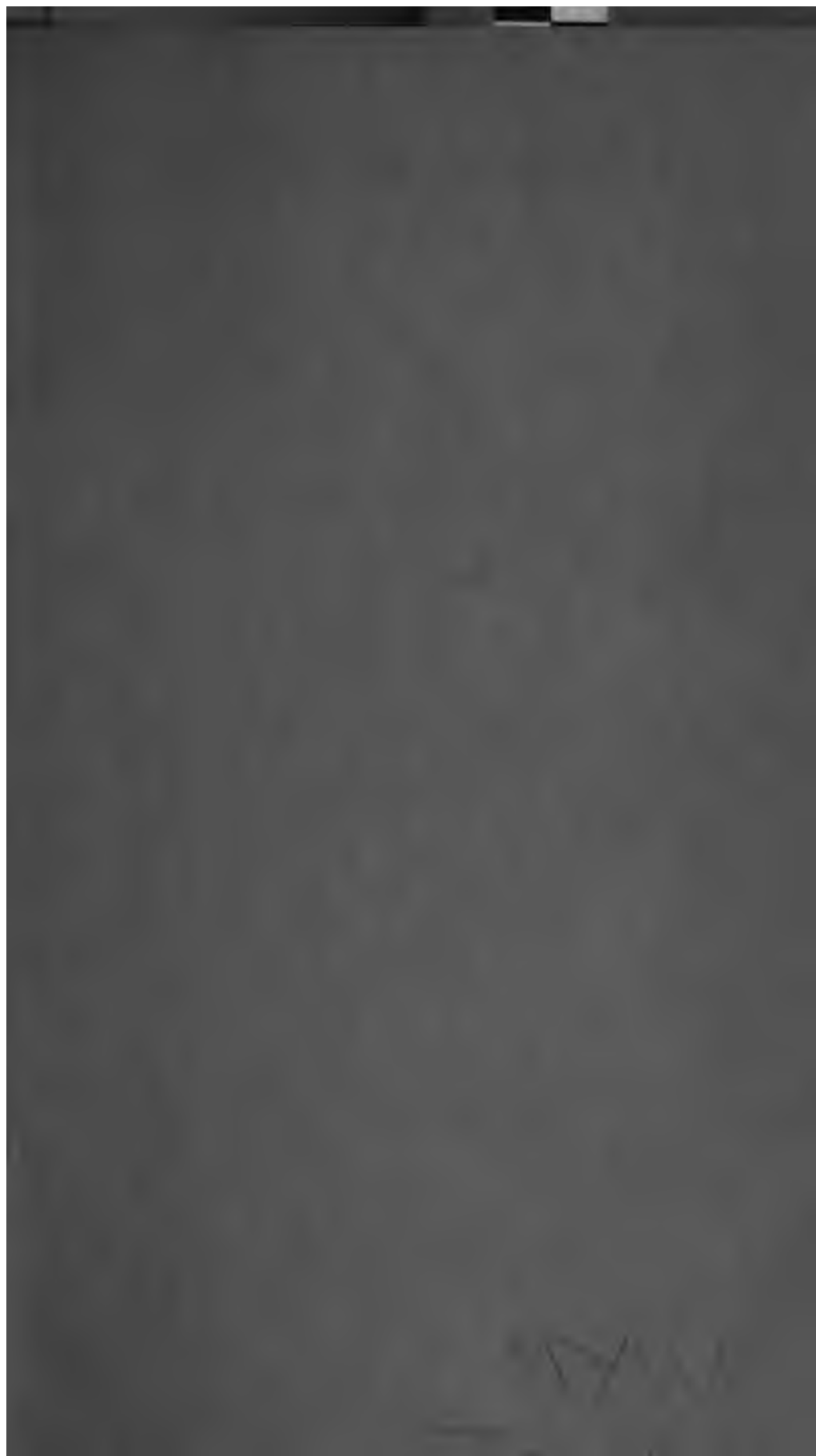
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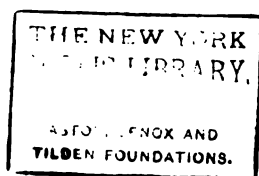
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EXPERTS
ON
GUNS AND SHOOTING.





THE BISHOP OF BOND STREET,
With a Bust of Colonel Peter Hawker.

EXPERTS ON GUNS AND SHOOTING

By G. T. TEASDALE-BUCKELL

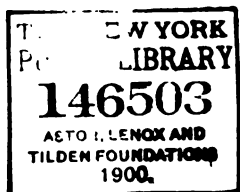
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INTRODUCTION.

ON SUCH a well-understood subject as the use of the shot gun the opinion of any one man is generally of little use to his fellows, and I venture to say that the more dogmatic a man may be, and the more experienced and successful, the less helpful his decided opinions usually are to his fellow-sportsmen. They will unquestionably be correct and applicable to his own case, but his sight, his nerves, his muscular development, and his breathing apparatus, and his stamina may all, or any one of them, make his advice, based upon his own experience, not only useless, but expensively misleading to any other user of the gun. For this reason, although a shooter of many years' experience, I have not, in the following pages, put forward my own opinions, except where I could not bring out the points I had in view without their assistance. In shooting, as in gunmaking, I have gone to many experts for opinions, and my care has been to present these opinions in a way that they shall not mislead by universal application, or by being misapplied to cases that they do not fit. My own hardest tasks in life have been set when I had to start by unlearning all the teaching I had had upon certain subjects, and in my capacity as Editor of *Land and Water* and reviewer of sporting books, I came across from time to time so much accepted opinion that did not stand analysis, and had certainly misled many sportsmen, that I determined to write the series of articles for *Land and Water* which is now collected in this form. That is the reason for the editorial "we" adopted in the following pages: that also is the excuse for criticism when those who know they have made mistakes, rather than admit a journalistic misfire, stick to their guns, careless of the harm they do to their friends.

I do not for a moment believe that any one man could give as much sound advice as is to be gathered from the somewhat conflicting opinions of many experts. I am sure, for instance, that in spite of thirty-five years' experience with gun and rifle, in which I have held my own with my neighbours, as I have also with sporting dogs at field trials, I could not hope to make a chapter on rifle shooting as interesting as the opinions to be found in the chapters on Messrs. Gibbs, Holland, Froome, and Rigby, all of whom have held the front rank as advisers or practical exponents of the arts of making and shooting the rifle for many years. The sporting rifle and shot gun gives private not public sport, and there is no public authority but his own opinion of his knowledge and ability for any man to put pen to paper about them, and fling another book into the enormous pile of unnecessary printed matter. That is a good reason, I hope, for the plan I have adopted of giving the opinions of experts.

The nearest approach to public sport in connection with shooting is, perhaps, the field-trial meetings that test the merits of pointers, setters, and spaniels, and sometimes retrievers. Between 1872 and 1884 I four times ran the winners in the Brace Stakes at the National Field Trials—certainly then the severest test—with dogs of my own breaking, and within the same period I won the Field Trial Derby an equal number of times, besides numerous other events. I have, moreover, sold retrievers of my own breaking, innocent of the show ring, for 100gs. each, and I might perhaps claim enough knowledge to put forward my own views upon dogs used with the gun, but I much prefer in this, as in gunnery, to “back” the “points” of others when they are not “false points,” provided I may at the same time show a decided disinclination to “back” when my predecessors in the literature of the gun are too staunch upon larks or other false scents. The fact is that so much of the false has been mixed up with the true in some technical shooting books, as well as in dog books, that what really ought to be wanted, by those who prefer reading to experience, is a sort of literary sieve, in which to preserve

the useful after getting rid of the misleading. A thorough sifting yet remains to be done, but I hope that my efforts to sift where I touch previous literature at all will be of some use to a generation of sportsmen who, according to Lord Beaconsfield, are particularly wise because they do not read.

I am aware that this hope savours of the paradoxical; but Lord Beaconsfield is the prophet of the paramount political power just now, and he did not gain that position without knowing what he was talking about. I rather suspect that he agreed with an earlier opinion to the effect that half the books written were lies, and that the other half were written to prove them so. At any rate his remark coincides with such views, as it is obvious that the reading of books of either class entails much unprofitable loss of time. If I wholly agreed with such opinions as these I should have remained for ever silent. I only go as far as to say that some books upon shooting which have been much read contain errors which, if left to individual experience in the field to find out, would entail an unnecessary loss of the time of other sportsmen, just as they have taken much of mine in the process of unlearning. What these are I leave to the following pages to show. As I have tried to apply the principle of the sieve to that which has been written by experts, so also I have applied it to the statements of those who have been kind enough to give me their views verbally for the purpose of this book. The only difference is this: that there is no obligation to criticise opinions that have not been made public, whereas the title of this book would not have been verified by the text had I neglected, and passed over in silence, printed errors that were being accepted as facts in many quarters.

To say truth, most of the mistakes to which I now refer are the outcome of a combination of theory and science, and they have been originated by people who have not had that ounce of practice which is proverbially worth a ton of theory. The science of shot-gunnery has not gone very far. In *Land and Water* I have published reproductions of photographs of rifle bullets taken when they

were travelling at the rate of 1,500ft. per second. Years after Mr. Fremantle went one better, and published photographs of the .303 travelling at about 2,000 f. s., but the photograph of the travelling small shot has yet to be accomplished, and the whole question of the shot gun after the shot has begun to disperse is difficult by comparison, exactly in the proportion as the number of pellets in the load. But modern science knows something, and sportsmen know a great deal, and the curious part of the matter is that what science has discovered has always hitherto been presented in a way that conflicts with experience in the actual sport. For instance, the long distances that, according to the reading of the chronograph, the sportsman is advised to aim in front of his moderate paced game looks absurd, at least to those who are never conscious of aiming in front at all and yet kill as well as their neighbours. Again, it has always hitherto been laid down that if a man is slow in getting off his gun, he must aim, according to his personal equation, more ahead of his game than another man who is quicker. The very obvious answer that a man knows his own speed, and that the slow man begins pulling trigger earlier than his faster brother, has never been thought of by any author of shooting books as a reason for absolutely neglecting all calculation of that kind: the personal equation has consequently entered into every, or nearly every, instruction to the would-be crack shot. The personal equation and calculations based on it are very interesting, provided nobody begins to make them at the approach of game. When they do they are not likely to end them in the presence of game—that is the worst of them.

No doubt hundreds of sportsmen have worked out the connecting link between science and practice for themselves; to those who have not had the time to do it I hope these pages will be a help; for certainly I have met very few good shots whose practice did not conflict with chronographic records; and yet neither are wrong, they only appeared to differ.

The history of gunmaking firms may not, perhaps, have much immediate connection with the subject in hand, except



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Father of Modern Rifle-boring.

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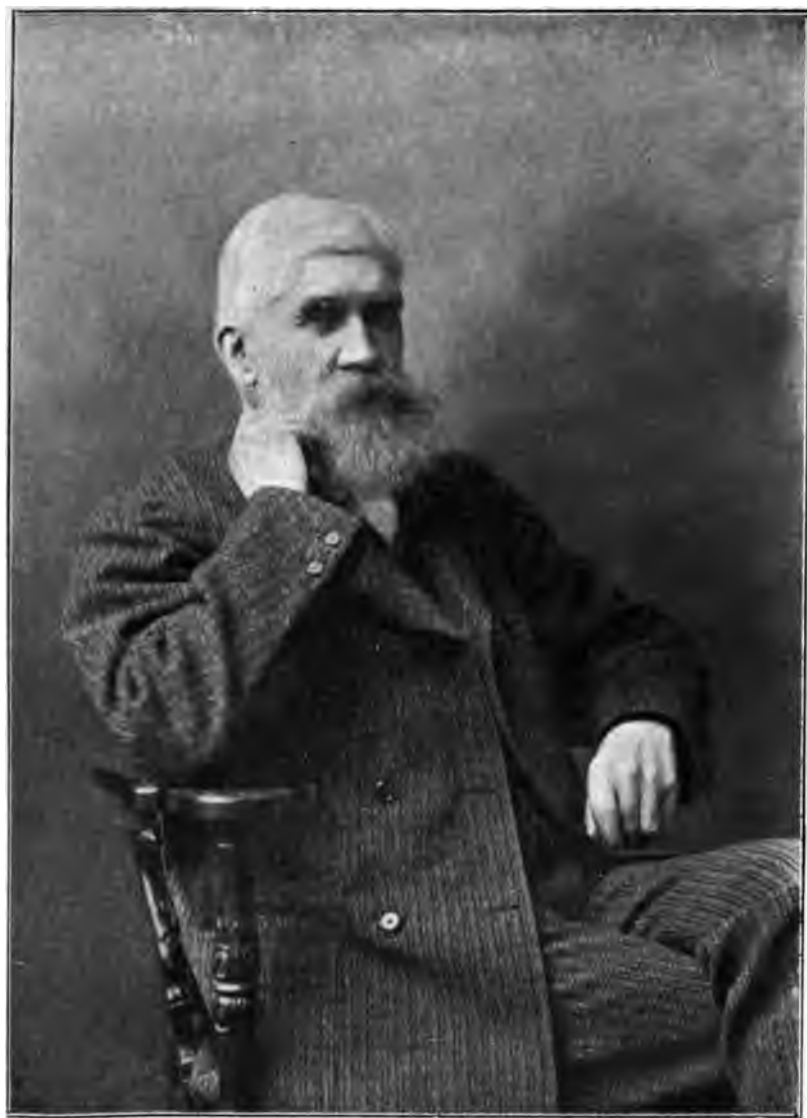
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

this :—where I have gone to individuals who are gunmakers for their opinions I have found it necessary to introduce them, and their histories, as their experience gives the only value to their opinion, and therefore not to know one is not to value the other.

The opinions of each gunmaker are always at the service of his customers, and, as a rule, the latter rely absolutely upon them in all matters of guns and cartridges; but the sportsman customer goes through life generally without hearing the views of the hundred and one other makers, many of whom may be better informed than their own particular manufacturer. I have tried to make it a feature to bring out the strong points of each man who has given his views, and when I cannot endorse them I say so. In speaking of the invention of any gunmaker I in no case give anyone's opinion except my own, except where I am particular to say whose opinions I quote. It would be obviously useless to give a manufacturer's opinion of his own goods; they are, naturally, always the best, and frequently conflict with the opinion of his next-door neighbour. But this is not always the case. I have found the gunmakers as a class honest towards their rivals, and if I ask of A. what sort of work B. puts in his guns, I invariably get a truthful, and sometimes a too generous answer. In no case have I chronicled the opinion of any mere salesman. The opinions on gunmaking that I have given in this book, as distinct from opinions on the use of the gun, are those most valued in the trade, and which lead the trade. Here, also, will be found the first journalistic approval of the one-triggered gun. This was more than a year in advance of approval by the *Field*, which went out of its way to condemn my approval. Since then there have been between forty and fifty single-trigger patents. The leader in this case was Robertson, of Boss and Co., and it is just such men as he is from whom I seek gunmaking information, and who in return I wish to place in their true light before shooters. Times change, and with them men, and I could indicate several crack London names which in the last few years have so much relied upon

others that the proprietors have become mere salesmen or booking clerks themselves. Their advice has not always more value for sportsmen now they are in a gun-shop than they had when they were keeping the books in other trades, and accordingly their opinions, whatever they may be, will not be found in these pages. It is true that a man who has not learnt to make a gun or to shoot one may become an expert fitter, but it is hard for him. There are so many different ways of doing the same thing in gunnery that it requires experience to know which of them is most likely to meet the particular case. But suppose a salesman does become expert in fitting a gun to a shoulder; that is the beginning of the end of his knowledge as a gunmaker, and it is not enough to make him interesting to the sportsman, however useful he may be. I can hope to be of some use to sportsmen by pointing to the new men whose guns are growing in value because they are of the very best, such as Robertson (with an old business which had gone down before he took it), Atkin and Beesley, who have built from the foundation—three men whom few can approach and none excel in gunmaking, and who the older generation of sportsmen did not know, because in their day they were turning out the finest work with other people's names, instead of their own, upon it.

There are some makers, notably the London maker Woodward, and the Birmingham manufacturers, Bland and Tolley, whom I have failed to get any information from for want of opportunity to talk with them. They are all exactly what they represent themselves to be. There are a host of Birmingham wholesale makers who have plenty of information, and to whom I should have gone had not Mr. T. Webley and his fellow-director Mr. Scott answered all the questions I desired to put. There are retailers who are also wholesale makers in Birmingham, such as Powell, whose workmanship is first-class, W. Jones, Lincoln Jeffreys, and Ford, who have plenty of information to impart had I been able to find room for more, the two latter of whom dispute with Mr. Leeson, of Ashford,



THE LATE SIR HENRY HALFORD,
Father of Long Range Rifle Shooting.

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ASTOR, LENOX AND
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Kent, and 29, Maddox Street, W., the championship of small bores.

Then there is a whole army of country gunmakers, most of whom are merely sellers of Birmingham work. Of course I except such firms as Gibbs, of Bristol, and other cosmopolitan, rather than provincial, makers such as Henry, Fraser, and Dickson, of Edinburgh. To each of the three I should have gone for information, had they been in town or I in Scotland. But although most of the provincial makers get their guns from Birmingham, as they are obliged to do where business is not big enough to support constantly-running steam machinery, yet there is an enormous difference between them. That is to say, some of them are merely salesmen; others have served their time under the best men, and become gunmakers in fact, as well as by profession.

It would have been very gratifying to me to be able to give a complete list of those provincials who are something more than salesmen and cartridge-loaders. I cannot, however, do that, because I do not know anything about a great many of them, but there are some whose claims to mention I cannot ignore, and who, had space permitted, would have been worthy a chapter to themselves.

I have compiled the accompanying table (pages xxii. xxiii.) in reference to those gunmakers whose history I know something of, and without any intention whatever to place them in front of other provincial makers whose history I do not know.

It has often occurred to me that a complete list of gunmakers would be useful to sportsmen who move about the country much, and frequently find themselves out of cartridges and at a distance from their regular supply. When this occurs, provided they know the name of a gunmaker, a telegram to their destination will usually bring cartridges to meet them on arrival, whereas a telegram elsewhere is certain to create delay. Accordingly I give an alphabetical list of the towns instead of putting the names of the gunmakers in that order. I omit London and Birmingham for obvious reasons, and apologise to those, if

Name.	Business and Date.	Apprenticed to.	Worked Under.	Inventions and Remarks.
Rosson, Charles ..	Derby.....	John Fraiser	Hollis & Sheath, Birmingham	The first try-gun, cartridge loader capable of filling 2,000 per hour.
Smythe, J. F.....	Darlington and Stockton-on-Tees	Alexander Henry, of Edinburgh	W. and C. Scott, P. Webley and Son, and W. W. Greener, from 1866 to 1877	—
Higham, George G.	Oswestry (Est.1825) and Welshpool	His father.....	—	—
Hinton, George....	Fore Street, Taunton	Westley Richards	Needham	Worked out the Needham ejector.
Cole and Son	Windsor, Devizes, and Portsmouth	—	—	Has been a gunmaking family for a century.
Farmer, R.....	Leighton Buzzard	His uncle	—	—
Jones	Hooton and Jones, 60, Dale Street, Liverpool	Williams & Powell	—	—
Hooton	Hooton and Jones, 60, Dale Street, Liverpool	.....	.....	Mr. Hooton is a well-known successful rifle shot at the meetings of the N.R.A.
Furlong, F. R.	Saffron Walden ..	His father.....	—	—
Blissett, J. G.	Blissett and Son, Liverpool (1837)	In Birmingham ..	—	—
Turner, Thomas Henry	Thomas Turner and Sons, Reading (1838)	Robert Carver, an outdoor workman for many of the London makers	—	—
Turner, Edward ..	Newbury	Robert Carver, an outdoor workman for many of the London makers	—	—
Palmer, Wm.....	Rochester (1797)..	His father.....	.....	} There have been several generations of gunmakers of this name.
Palmer, H. E.	Rochester (1797)..	His uncle .....	.....
Richards, Wm.....	Preston	Joseph Smith, Birmingham, and his father	.....	As a Volunteer he won many prizes.
Richards, Wm., jun.	Preston	His father	—	—
Turner, H. A.....	Marlborough, Wilts	Birmingham	—	—
Anderson, John....	52, Market Place, Malton (1800)	His father.....	—	—

Name.	Business and Date.	Apprenticed to.	Worked Under.	Inventions and Remarks.
Anderson, John Wm.	52, Market Place, Malton (1800)	Messrs. Bentley and Playfair	Messrs. C. Os- borne and Co.	—
Hodgson, J. P.	Louth.....	Wm. Edwin Dodson	Royal Small Arms Factory and Corps of Arm- ourers in 1863	—
Benbow, J. G.	Oswestry	Cashmore	Chas. Osborne and Co.	—
Mountstephen, J. H.	Torquay and Ply- mouth	Stanley, of Wey- mouth	In Birmingham and in the Army	—
Bond, G. E.	Thetford (1818) ..	.....	.....	The granular wad and the lightning turn- over machine.
Maleham, C.	His father	Sheffield, about 1840	—	—
Robb, Andrew	Playfair and Co., C., Union Bridge, Aberdeen, 1821	His father.....	.....	Snowie's of Inverness was founded by Mr. Playfair.
Leeson, W. R.	Ashford, Kent, and 26, Maddox Street, W.	.....	.....	Makes a specialty of small bores, and has won many prizes for rifle shooting.
Leeson, A.	Ashford, Kent, and 26, Maddox Street, W.	Messrs. Webley ..	—	—
Fape.....	Newcastle.....	.....	.....	Winner of the first London gun trials before choke boring.
Snowie.....	Inverness .....	.....	.....	The first to publish an annual list of shoot- ings.
Bartram, G.	Braintree .....	.....	.....	A scientific gunmaker who has shown ex- cellent work with pointers at field- trials.
Green, Edwinson ..	Cheltenham ....	.....	.....	A single-trigger action.
Edwards, C. G.	C. G. Edwards and Son, 2, George Street, Plymouth	.....	In the provinces	Has been in the same family for 80 years.
Jeffery, W.	W. Jeffery and Son, 12, George Street, Plymouth	His father.....	—	Purchased the business 50 years ago, from Harvey of Exeter.
Smallwood, S.	S. Smallwood, 4, Mardol, Shrews- bury, and at Birmingham	His father.....	Messrs. Wood- ward, London, and the Army and Navy Stores	—

any, whom I have inadvertently omitted from my list. The number of streets is unnecessary to the telegraphic address, provided the word *gunmaker* is added where the street is not given.

Amliac, Anglesey, W. Jones.
 Aberdeen, C. Playfair & Co.
 Andover, E. Chamberlain.
 Ashford, Kent, Leeson.
 Barnstaple, Mrs. A. Gale.
 Bedford, W. Darlow.
 Beccles, Suffolk, Harry Tilney.
 Belfast, William Hunter.
 Belfast, J. Braddell & Son.
 Blackburn, James Gregson.
 Blairgowrie, J. Crockard & Son.
 Blandford, Arthur Conyers, 59,
 East Street.
 Boston, E. C. Slingsby.
 Brampton, Cumberland, W. Mil-
 burn.
 Braintree, G. T. Bartram, Bank
 Street.
 Bridgwater, S. Norris & Son.
 Bristol, G. Gibbs.
 Brigg, G. H. Hockey.
 Brighton, L. Weston.
 Bournemouth, A. H. Lightwood.
 Bury St. Edmunds, John A.
 Scotcher.
 Cambridge, Gallyon & Sons.
 Canterbury, J. Fox.
 Cardiff, S. Chambers.
 Carmarthen, G. Giles.
 Clitheroe, J. Baldwin,
 Chelmsford, W. A. Leech.
 Cheltenham, McLoughlin & Sons.
 Cheltenham, E. C. Green.
 Chester, H. Monk.
 Chippenham, J. B. Warrilow.
 Church Brampton, A. H. Rutt.
 Cirencester, C. R. Holland.
 Cockermouth, G. P. Graham.
 Colchester, John S. Boreham.

Cork, T. W. Murray & Co.
 Corhampton, Manning & Vicery.
 Cromer, C. Francis.
 Darlington, J. F. Smythe.
 Devizes, Wilts, A. E. Cole & Co.
 Derby, John Fry, Sadler Gate.
 Derby, Charles Rosson.
 Dorchester, C. Jeffrey.
 Driffield, J. Conyers.
 Dublin, Trulock & Harris.
 Dumfries, J. Mitchell & Son.
 Dundee, J. R. Gow & Son.
 Durham, G. Robson.
 Edinburgh, J. Dickson & Son, 63,
 Princes Street,
 Edinburgh, Fraser.
 Edinburgh, Alexander Henry & Co.
 Exeter, S. A. Agnew, 79, South
 Street.
 Eynsham, E. J. Gibbons.
 Framlingham, B. Norman.
 Gainsborough, Charles F. Liver-
 sidge.
 Glasgow, J. D. Dougall & Son.
 Glasgow, A. Blaw.
 Glasgow, C. J. Annan.
 Gloucester, F. S. Fletcher, 158,
 Westgate Street.
 Gloucester, Charles F. Green.
 Gray, W. P. Walker.
 Guildford, Samuel R. Jeffrey.
 Hereford, B. E. Ebrall.
 Hereford, Philip Morris.
 Holbeach, J. C. Hardy.
 Honiton, Matthew Bros.
 Honiton, H. J. Materface.
 Horncastle, G. H. Wilson.
 Hull, W. W. Greener.
 Huddersfield, W. Golden.

- Inverness, J. Graham & Son.
 Inverness, Hugh Snowie & Son.
 Ipswich, Frank A. Bales.
 Jedburgh, Greenbank & Son.
 Kelso, G. Forrest & Son.
 Kilmarnock, W. McCrick.
 King's Lynn, L. G. Clough, 52,
 High Street.
 Knaresborough, C. Hall.
 Landport, Portsmouth, George
 Newnham.
 Launceston, Cornwall, T. Symons.
 Leamington, John Hobson.
 Leeds, Linsley Bros.
 Leicester, Clarke & Son, Gallow-
 tree Gate.
 Leighton Buzzard, R. Farmer.
 Lewes, Gerald Lloyd.
 Leyburn, R. Campbell & Son.
 Limerick, A. Nestor.
 Lincoln, Wallis Bros.
 Lincoln, J. R. Hanson.
 Liverpool, W. Richards, 27, Old
 Hall Street.
 Liverpool, George Higham.
 Liverpool, Hooton & Jones.
 Liverpool, Williams & Powell.
 Liverpool, Messrs. Blissett & Sons.
 Long Stratton, J. Brewster.
 Louth, J. P. Hodgson.
 Luton, J. J. Langley.
 Malton, Yorks, J. W. Anderson.
 Manchester, William Griffiths.
 Manchester, J. Percy, 48, King's
 Street, W.
 Marlboro, H. A. Turner.
 Newark, Smith & Sons.
 Newcastle-on-Tyne, Armstrong &
 Co., 5, Collingwood Street.
 Newcastle-on-Tyne, W. R. Pape,
 Collingwood Street.
 Newton Abbot, J. Clarke & Son.
 Newport, Isle of Wight, Wood &
 Tame, 114, Pyle Street.
 Newton Stewart, J. Erskine & Son.
 Northampton, Rowland Hill.
 Norwich, E. Wilson.
 Nottingham, T. Knight.
 Nottingham, J. Frampton.
 Nottingham, S. Jackson.
 Oban, C. H. Bishopp.
 Oswestry, J. G. Benbow.
 Oswestry, George G. Higham.
 Oxford, S. G. Venables.
 Oxford, F. E. Webb.
 Perth, R. Lees.
 Plymouth, F. H. Edwards, 2,
 George Street.
 Plymouth, Jeffreys & Son.
 Pocklington, Yorks, H. Conyers.
 Portsmouth, Cole & Sons.
 Portsea, J. Marks.
 Preston, William Richards.
 Reading, Market Place, T. H.
 Turner.
 Reepham, Norwich, E. Gibbs.
 Retford, Nottingham, F. West.
 Repton, W. Hodgson.
 Saffron Walden, F. R. Furlong.
 Scarborough, F. Rhodes, 5, North
 Street.
 Sevenoaks, T. E. Kither.
 Sheffield, C. H. Maleham.
 Shepton Mallet, G. Chambers.
 Sittingbourne, Kent, W. G. Palmer.
 Shrewsbury, Samuel Smallwood.
 Shrewsbury, C. W. Ebrall.
 Skipton, C. S. Griffiths.
 Sleaford, W. M. Hooton.
 Southampton, John Patstone.
 Southampton, Cox & Clarke, 28,
 High Street.
 Southampton, Cox & Macpherson.
 Stirling, D. Crockart.
 Stowmarket, T. A. Dadley.
 Swaffham, Johnson & Son.
 Taunton, George Hinton.
 Thetford, G. E. Bond.

Tiverton, Devon, William Thorn.	Warrington, T. Dainteth.
Torquay, J. H. Mountstephen.	Windsor, A. E. Cole & Co.
Tonbridge, P. Powell.	Windsor, T. C. Hill.
Tring, G. Grace.	Winchester, Hammond Bros.
Truro, T. H. Tims.	Woolwich, H. Andrews.
Ulverston, Tom Parkinson.	York, T. Horsley & Sons.
Wakefield, B. Boston.	

It is extraordinary how some of the gun businesses have descended from one to another member of the same family for long periods. Thus, the Devizes business of Cole and Son has been in the same family for 150 years.

Higham, of Oswestry, has for many years supplied the trade with quantities of gun-stocks from wood grown in the neighbourhood.

Rosson, of Derby, deserves special mention. He saw the necessity for a try gun, which he invented but did not patent in 1876, and this gun, along with Mr. Oliver's, prevented the Jones patent becoming a master patent.

About 1880 there were a good many guns burst by nitro-powders. One reason for this was too heavy ramming, and it was then that Mr. Rosson invented and used a rammer which would only give one weight of pressure, no matter if struck with a steam hammer, so that by no means could either more or less pressure be put on the powder. In 1894 he invented on this principle the cartridge machine which fills 1,200 per hour (and can be set to run at 2,000 per hour if required).

Mr. Rosson says of it that the charge of powder never varies more than a quarter of a grain in a charge of forty-two grains; it loads all the concentrated powders perfectly; the shot only varies two to three pellets out of a charge of 1½oz., and the ramming and turning over does not vary at all; the pressures are perfectly uniform. This machine he patented, as also an ejector mechanism.

Another example of a successful provincial at a period when provincial gunmakers are experiencing hard times is J. F. Smythe, of Darlington and Stockton-on-Tees. During his connection with the late Mr. Alexander Henry he came in contact with most of the celebrated Scottish marksmen

of the day, notably the famous Deerstalker and his sons, Capt. Ross and Horatio Ross ; Lord Elcho (the present Earl Wemyss), and many others. Later he took the practical management of Trulock and Harris's old business in Dublin, and remained there until 1884, when he purchased the business of the late Mr. Brehner, at Darlington. He has been successful. For instance, some two years ago he made an alteration to a pair of guns for H.R.H. the Prince of Wales, and was so successful that his Royal Highness found an opportunity of tendering him his personal thanks. Then Mr. Turner, of Reading, does a very large cartridge business. Blissett and Sons, besides being gunmakers for the shipping trade, are also large firework manufacturers. Hodgson, of Louth, has had a very varied experience, not the least interesting being that in which he taught the people of Japan to make guns on the English system. Another case of generations of gunmakers is that of William Richards and Son, at Preston. The elder has been also a successful rifle-shot. One London maker, to whose guns I was introduced forty years ago, I happen to know very little of personally ; I mean Blanche. Nevertheless, he disputes with Mr. Purdey and Mr. Woodward the hereditary title to London Gunmakers ; all the other old families of gunmakers having died out and been replaced, many of them under the old trade names, by new men.

I have to thank the proprietors of *Land and Water* for the use of the blocks with which most of these chapters, which originally appeared in that paper, are illustrated, and also to tender my thanks to those who have assisted me with the conclusions they have arrived at after long experience.

EXPERTS ON GUNS AND SHOOTING.

CHAPTER I.

THE EVOLUTION OF SHOOTING DURING THE CENTURY.

SHOOTING is a term so variously understood, according to the memories it calls up, that it is almost too big a subject to attempt to deal with in a short article. Shooting means to one man the first of September in English turnip fields. To another, no more nor less keen, it may mean elephant shooting, or tiger shooting with elephants for shooting-ponies. To yet another man it may call up nothing but the dark discs and recollections of Wimbledon or Bisley. To a Colonel Hawker, or a modern imitator, it would, in its most enjoyable form, mean a north-easter with the thermometer below zero, a punt gun, and only half an inch of plank between himself and eternity. To a fifth it may call up recollections of hard gallops after American bison and the deadly work of the revolver, or its kindred African sport of riding down the giraffe. To another lucky individual it may mean the killing of five lions in a quarter of an hour, a record that was illustrated in *Land and Water* but a short time ago; and there is still another, and a greater, form of shooting, in which the object is to pierce the strongest steel armour-plates that can be placed to protect the vitals of the most mighty monsters that ever floated on the seas—the guns, the ships, the armour, and the steel itself, all the outcome of the reign of Victoria, and mostly the product of the brains of her self-governing subjects. When Her Majesty came to the throne, the ships of Nelson and the guns of Nelson were still the guns and ships of the British Fleet; years after the Queen's accession the greatest landscape painter

that ever lived, J. M. W. Turner, painted his last picture, and it represented the beginning of a new order and the end of an old one. "The Fighting *Téméraire* Tugged to her Last Berth" it is called, and it is now in the National Gallery for everybody to see—the dirty tin kettle tugging the mighty ship, fallen from her high estate, to the Chelsea hospital for dismantled battleships. The sailors had nicknamed Turner the Admiral, and surely no admiral ever knew a battleship better than he did, but it was not an iron-clad that he knew. As a last effort he painted the decline as he had in the prime of his life painted the glory of the wooden walls of England: ships whose guns would be but toys to-day, and were made most effective when one warship grappled another, and poured broadsides into her as fast as muzzle-loaders could be run out and fired. Grand sport! But our ideas of sport change with the times. When the Queen began her reign, sport with the fowling-piece was as different from what it now is as an Armstrong 100-ton gun is to the guns of the *Victory* that are still in existence. Sixty years ago the flint-and-steel was still the general weapon, although three years before this Lancaster had converted Colonel Hawker's Joe Manton guns to take his newly-invented detonators. Shooting was only then beginning to be made easy, and it was then, and remained for twenty years at least, a most sportsmanlike thing to do to kill the whole covey as it rose, with a single barrel if possible. The only thing that could be said against it was its difficulty. On September 9, 1835, Colonel Hawker wrote:—

"A very stormy day, and birds wilder than ever. I got fifteen partridges. N.B.—I owe my bag to two extraordinary shots. I began with firing at five birds, and bagging four of them with one barrel, and finishing my evening with springing four birds on an oat stubble, and blowing all four of them down at one shot; three fell short, and the old cock flew and towered and was also bagged. These extraordinary shots occurred, I conceive, owing to the tremendous gale of wind, and my having taken out my miraculous 'Old Joe,' a gun which I can pitch with more rapidity than any other I have, and am, therefore, frequently able to catch the birds before they have time to divide; add to which this gun cuts out all my others for throwing a regular circle of shot."

This was no extraordinary circumstance, and the spirit of war against the game was carried so far that on occasion the same sportsman mounted his punt gun upon his cart and took pot shots at the partridges on the ground, a proceeding as little according to the taste of the present day as browning the covey is. The only form of shooting into the brown that has survived, as an act of sport, is the use of the punt gun upon wild-fowl. The fowl have become so reduced in numbers on our coasts that some protection to the home breeding ducks seems desirable; but it is neither desirable nor possible to prevent our professional and amateur shooters from securing a fair share of the foreign geese and widgeon that visit us. "My gun missed fire at the geese," writes Colonel Hawker in 1837. "But I came home early in order to despatch baskets of fowl for His Majesty and others." This was no unusual accident with flint-and-steel guns, as we can remember when we occasionally used them twenty-five years afterwards. The great excellence to which some of the London work had attained enabled the gunner usually to time himself correctly; but the guns, however well made, were all slow compared to our weapons to-day. There was almost what we know as a hang fire. This was caused by the flash of the powder in the pan having to ignite each grain in the communicating hole by almost absolute contact. The flash itself was free to go in the open air, and was not driven into the barrel, as was the case when detonators came to be used, but followed the course of least resistance, which was away from the barrel, and not towards its interior. No doubt this made snap shooting, as, say, at rabbits crossing a path in covert, a very difficult performance, although if a gunner timed himself correctly there would be no greater difficulty in shooting at most game, and we have Colonel Hawker describing his own success at fourteen consecutive snipe. This of itself would not prove great shooting, because snipe vary in their flight so much, according to the time of year. A snipe, for instance, in August, as found upon the moors, is an owl compared to the same bird in an early frost in November. Fourteen of the former consecutively would

prove nothing, except that the shooter was greedy for immatured food ; but fourteen of the latter would prove that a good shot had had great good luck. Colonel Hawker, in his Diary, chronicles the event which brought the Queen to the throne thus :—

“21st June, 1837, Keyhaven. Received a *Morning Herald* announcing the death of our beloved sovereign and my kindest benefactor, King William the Fourth, whom it pleased the Almighty to take to ‘another and a better world,’ between two and three o’clock yesterday morning. Although this sad event was what we had reason to dread every day, yet I felt it so much as to be unable to do anything.”

Colonel Hawker, as the foremost shooter of his time, was a great favourite, not only of King William, but also later of the Prince Consort. We are inclined to believe that the singleness of mind that usually belongs to a good sportsman has always, ever since, found appreciative friendship at Court.

The rifle we now have in the Army, our second line of defence, has been evolved out of the weapon used for deer-stalking, for it is nothing more than a very small bore express. It is not, therefore, unduly stretching the patriotic purpose of Royal favour when it is bestowed on a scientific sportsman.

We were about to say, men like—until we remembered there are no men like—the late Horatio Ross and the late Sir Henry Halford deserved well of their country, and what they did for the science of gunnery and for the encouragement of rifle shooting was the direct outcome of their love of sport. Colonel Hawker was a true type of sportsman, and for singleness of purpose was peculiar amongst sportsmen. “Joe shot like an angel also ; he discharged ten rounds and pocketed his ten birds in brilliant style. What care we for all Europe ?” Only a sportsman can write like that, and only a man intent upon consummate skill in killing could have penned the following :—

“I was very lucky in making cannons to-day (catching two birds as they cross, and then firing so quick as not to allow them to open

again), as I got two at a shot three times, and three at a shot once. This is the most consummate beauty and difficulty of the art, and always more than covers the misses of any good shot."

Partridge-shooting was only the beginning of the shooting season; afterwards the wild-fowl took until the end of March to deal with, and made by far the biggest show. Now we go abroad for big game, if we must shoot after the last January pheasant has fallen. Such work as the following is no longer to be had on our coasts :—

"January 27th, 1838. Most glorious sport. Forty-nine geese and two such splendid wild swan, that one weighed twenty pounds all but three ounces; another old swan fell dead at sea. I had only four shots: the first, a single swan, a long way off; the second at ten swans, an immense distance, when I killed two with the one I lost at sea; the third, shot twenty geese, and sacked all; the fourth, twenty-nine geese, and sacked every bird. I had three punts to cut off every cripple from reaching the Channel. Never was there a more satisfactory day to finish a week."

Yet the grand total of Colonel Hawker's fifty-one years of sport is only 17,753 head; whereas, in twenty-nine years, Lord De Grey has killed over 300,000. The difference is one between preservation and a state sometimes called the balance of Nature, in which man, on the same side as the vermin, eat up the game between them.

The difference between the bag of a great sportsman fifty years ago and one of to-day may be hardly fairly put in comparing that of Colonel Hawker with that of Lord De Grey. The former had not the run of the best preserves in the country, and when he shot pheasants he did so as a poacher, going through his neighbour's coverts in spite of gamekeepers, and clearing them out, after having sent the keepers on a wild goose chase. Lord De Grey, on the other hand, goes all over the country to the best shoots, and travels by rail, whereas the Colonel had to confine himself mostly to his own little shooting and a few excursions by coach. The sea, however, was his free warren, and out of the bag quoted, 4,488 were game birds of the sea, including thirty-eight hoopers, 1,327 Brent geese, 2,211 widgeon, 441 wild ducks, and 135 teal. Included also in the 17,753, but

not included in the 4,488, were 2,116 snipe and 7,035 partridges. Lord De Grey's twenty-nine years' bag of partridges is 111,190, and of snipe 2,735. We are not sure that this means that partridges have much increased in numbers, and we are quite sure that snipe are much fewer than they were in Colonel Hawker's day. What it really means is that a totally new class of sportsmen with the gun have arisen, one that adopts steam power as an aid to the gun. This cosmopolitanism has its defects as well as its bright side. Many of the great shooting-places have ceased to be local affairs, at which friends and neighbours meet, and occasionally make the acquaintance of one or two crack shots from a distance. Now it is more often an assemblage of good shots from a distance, nobody besides. This tends towards professionalism, and single-sport sportsmen, and the division of the followers of one sport against all others. Much as we all desire to see things done well, we can conceive nothing more calculated to make shooting unpopular than a system in which most of the game is killed by a few dozen or hundred practised "circuit" gunners, while the rest figuratively look on from a distance. We do not say that the system has gone too far. There are antidotes in existence where the owners of great estates are absolutely careless about records, and select their guns with the sole object of pleasing those they desire to please, and not with a view to record-breaking. We remember an amusing instance of this record-breaking spirit, in which a first-generation man, as a landed proprietor, had set himself to beat his next neighbour. What with a magnificent staff of keepers, hand-rearing, and crack shots from a distance, he had done so for years; but what was his amazement on one occasion, after this state of competition had been going on for a dozen years, when, in conversation with his neighbour, the latter affirmed that he made it a rule to make no difference between good shots and bad ones—the battle had proceeded for twelve whole years, without one of the two combatants knowing that he was fighting. We heard the conversation to which we refer, and shall never forget the astonished depression of the victorious shooter.

who with much ado had won a walk-over. The extraordinary length of time that this competition proceeded created much amusement in the county, for the true state of the facts were known all the time to everybody except the two principals.

The record of game killed by Lord Malmesbury from 1798 to 1840 is a better and fairer contrast to that of Lord De Grey than is that of Colonel Hawker, but the parallel fails in this respect—that Lord Malmesbury's was made on one estate, and Lord De Grey's probably ranged over scores of estates. Lord Malmesbury killed 38,475 head in the period, having walked 36,200 miles in 3,645 days. He missed 16,766 shots, and his bag included 10,744 partridges, 6,320 pheasants, 4,694 snipe, 2,767 wild-fowl.

Lord Malmesbury, as a sportsman, much more than Colonel Hawker, forms more of a fair contrast for the present day. Colonel Hawker hardly ever shot without killing, and although he talks of wonderful distances and extraordinary long shots on almost every page of his diary, yet we cannot accept him as a fair judge and trustworthy narrator, for this very good reason: that at long shots no gun could do the work he records of himself. It matters not how an ounce and a quarter of shot are distributed over a target at forty yards, and even more at fifty yards; there are always spaces through which a partridge could fly untouched by a single pellet, and these spaces are as likely to be found in the exact centre as in any other part of the shot-circle. This being so, we must accept Colonel Hawker's extraordinary long shots as shots well within killing range, otherwise he could not have made the great number of consecutive kills that he constantly—and we believe truly—records. We expect that the absolute test of the target would show that no gun was ever built by Joe Manton that at forty-five yards would hit a partridge with a single pellet five times out of six shots; yet Colonel Hawker was constantly making straight runs of forty or more kills. We cannot help thinking, therefore, that what appeared to him extraordinary long shots were not, in fact, longer than about forty yards at the outside, and we should for choice

put them at thirty-five yards. No doubt other longer shots were occasionally recorded by him ; but we are speaking not of the occasional, but of the distance he was in the habit of shooting.

Some years ago Lord Walsingham kindly sent to us a record of four consecutive kills of wild duck with No. 5 shot, all between eighty-four and one hundred and fourteen yards, and these distances were actually measured. No doubt, accident would account for a short run of four kills, even at such distances as that ; but if we multiplied the chances by ten, what would be the result at those distances? Certainly more misses, or wounded birds, than kills. It appears, then, that the habit of Lord Malmesbury was nearer to that of the present day than was that of Colonel Hawker. The former made 38,475 kills in 55,241 shots, by which it is possible to conceive him shooting occasionally at such distances as those recorded by Lord Walsingham ; whereas it is impossible to believe that Colonel Hawker's record could have been maintained had he done anything of the kind.

This proportion of kills is somewhat similar to that of Lord Walsingham's record at driven grouse, when he killed 1,056 birds, and used about 1,500 cartridges in doing it. Twelve more birds were afterwards picked up, making the day's score 1,070 grouse.

Colonel Hawker's style was that greatly in favour at that time, and even as late as thirty years ago we have known men pride themselves on a straight run of forty-five kills at game. But while they were about it some of us, who could miss without flinching, killed a good deal more game than the never-miss men. For many reasons comparison has ceased to be made on the number of misses to kills, and it is now a question of who shoots the most often with a fair proportion of kills. The never-miss school was bound to die the moment it found itself facing driven partridges and grouse. It no longer was a question of distance exclusively, but one of ever-varying speed. Shot for shot, we do not think the driven bird as hard to bag as the walked up one, provided that, at the latter game, all reasonable chances are

taken. Say that a man shoots at everything that *rises* within forty yards, no matter where his feet may happen to be when the flush occurs, and tries for his brace whenever they rise five yards nearer. With driven grouse and partridges and rocketing pheasants the difficulty consists more in timing the pull of the trigger than in accuracy of aim; whereas, in walking up game, nerve, pulse, and breathing apparatus are very likely to get out of order, especially when ascents are steep, or when peat hags form the soundest foothold to be found.

	Lord Malmesbury's Personal Bag between 1798 and 1840.	Colonel Hawker's Personal Bag between 1802 and 1853.	Lord De Grey's Personal Bag between 1867 and 1895.
Rhinoceros	—	—	2
Tiger	—	—	11
Buffalo	—	—	12
Sambur	—	—	19
Pig	—	—	97
Deer	—	3	186
Red Deer	—	—	381
Grouse	—	16	47,468
Partridges	10,744	7,035	89,401
Pheasants	6,320	575	111,190
Woodcock	1,080	68	2,077
Snipe	4,694	2,116	2,735
Wild Duck	(Sec other fowl)	441	1,393
Black Game	81	11	94
Capercaillie	—	—	45
Hares	5,211	631	26,417
Rabbits	7,417	318	26,747
Various	—	206	8,424
Quails	50	58	See various
Landrails	95	56	See various
Wild Swans	3	38	See various
Wild Geese	8	1,353	See various
Other Fowl	2,756	2,656	See various
Bitterns	10	—	(?)
Golden Plover	6	—	See various
Plover of three sorts	—	351	See various
River and Seashore Birds	—	1,821	—
Totals	38,475	17,753	316,699

From 1834 to 1857 nothing new occurred to the fowling-piece; the flint lock had been abandoned, except by the most conservative sportsmen, and the breechloader was brought from France by the late Mr. Joseph Lang. It took some ten years to become universal, for, to say truth, a good many of the new guns were more noted for their escape of gas at the breech than for their killing powers. Gunmakers, in London at least, conquered this evil in a very few years. One of the great points that was held forth by the advocates of breechloaders was that a pair of guns and a loader would no longer be necessary. We have now got speed accelerated beyond that possible with the old breechloader by the addition of the hammerless ejector, and we have falsified prophecy by requiring three guns instead of two, and means, besides, of holding them without touching with our hands the burning barrel. So much for prophecy, but then the prophets did not consult the gamekeeper.

Preservation was in its infancy. The driving of game was beginning to show that the worst vermin on a shooting estate was a quantity of old cocks—grouse or partridges. We had not arrived at that beautiful stage of marksmanship which picks out the old cock partridge, as he rises, for the first barrel, in spite of the intervening covey. If we had done so, driving would not have made any difference to partridge-preservation, for the barren pairs always suffered; it was the coveys that got wild. With grouse the subject was vastly different. The old cock grouse is not as careful of his children as the partridge, and does not mind leaving them to rise a hundred yards nearer the pointing dogs than he believes to be safe for himself. In fact, before driving came in, the old grouse cocks could take care of themselves, and assisted the "balance of Nature" next spring by driving off every young grouse that ventured to "pan out a claim" within a quarter of a mile of headquarters. Peace is as necessary to the increase of the population of a grouse moor as it is to that of a nation, and where the old grouse cock is there is no peace for the young ones.

The method of killing game has entirely changed since 1837. From the beginning of the century until about 1850

the general method of pheasant-shooting was to kill the birds wherever they were discovered, in a hedgerow, or a turnip-field—not even a spaniel being admitted on such occasions, but a steady old pointer, for preference, was taken. Both Blaine's "Rural Sports" (1858, Longmans) and "Thornhill's Sporting Directory, 1804" (page 114), describe this method. But yet we believe that there were sportsmen as well as pot hunters then just as there are to-day, and that one man would then work his birds in order to get the most sport out of them, while another would regulate his methods with a view to nice, easy shots and pot luck. In these enlightened days the differences that exist are quite as wide, and the only wonder we ever feel about the matter is that the latter-day sportsman who crowds up to the rise of the pheasants conceives himself to be quite as admirable as anyone who ever managed a beat or handled a gun. Spaniels were at one time considered a necessity to good covert shooting, and the method adopted of hunting three couples of mute spaniels—Clumbers, of course—"in a fan" in front of the guns is admirably described by General Hutchinson in his excellent book on dog-breaking, published by Murray. This method was adopted at Clumber, and at many other great shooting places. In wilder countries, where the Clumber was found too soft and too heavy for the rough ground, the Sussex spaniel and the Cocker were employed; but they all gradually went out of use before the increase of numbers of the game, an increase that made it worth while to turn out a whole parish, and employ eight or ten shooters for the big days. Dogs, except retrievers, were never whelped that, worked by one man, could serve ten guns; and the art of dog-breaking was never generally understood in this country, so that each man could not bring his brace of Cockers to hunt with stranger dogs in the same manner that he is *supposed* to bring his retriever to-day, to look after his own interests. Setters, pointers, and spaniels were never intended by nature to hunt in flocks for a regiment of guns. On the contrary, we can gather from the "Oakley Shooting Code," published by Ridgway in 1836—the year before the Queen came to the throne—that

“although shooting is a social amusement, the shooter seldom seeks any other company than his dog when out.” We think the shooter was a sportsman then, and in consequence. It is only the true sportsman that is satisfied with his own good opinion and the appreciation of his dog ; yet, the same individual would be more than a man if he did not value others’ appreciation also, and less than a sportsman if he went a yard out of his way to get it.

We do not think that any of the great shots of to-day can afford to sneer at the performances of Lord Malmesbury, who walked a mile for every head of game he got in his forty-two years of sport, nor at the methodical plodding of Colonel Hawker. It does not follow that their methods were not the best, because they had not as much game to kill as exists now. In the middle of the last century enormous bags were common on the Continent, but seem to have fallen out of fashion. In Bohemia, on one occasion, no less than 47,950 head were killed in twenty days’ shooting in 1753. The shots fired were no less than 116,231, and some doubt has been expressed whether a good deal of the game did not get mobbed in the nets ; but as 19,545 partridges were killed in twenty days, we cannot conceive how shooting could have been conducted in which nets, for these birds, did their deadly work. It would have been very dull work for the gunners merely to have shot when a bird escaped the nets. Moreover, as larks 114 and quails 353 were included along with ten wild boars, it would puzzle us, or anybody, to say what kind of net might be effective for all these different creatures. The shooters were twenty-three, and included the Emperor of Austria, as well as the Princess Charlotte. This bag was : Hares 18,273, partridges 19,545, pheasants 9,499, stags 19, roedeer 77, wild boar 10, larks 114, quails 353, other birds 54, foxes 6 ; a total of 47,950 head.

The most extraordinary record of 18th century partridge shooting is recorded in the game book at Chantilly. Thus on October 7, 1785, the two Princes de Condé and the Prince Conti, with twelve guns besides, killed 2,580 partridges, 1,593 hares, 24 rabbits, 12 pheasants, 2 fieldfares, and 2 larks ; a total of 4,213 head.

Such records as these were never made in England, as far as we are aware, and they do not much concern the growth of shooting; except to the extent that they proved the possibility of the high preservation of game of which the beginning of the century saw nothing, and the end sees much.

The biggest head of pheasants known to have been killed before the Queen came to the throne was in 1807, at Rendlesham, where 192 pheasants were killed on one day and 195 on another. At the same period, at Holkham, a party of guns managed about 500 head, all told, per day's cover shooting. In 1823, Mr. William Coke, in his match against Lord Kennedy, killed 80½ brace of partridges on September 26, and 88 brace on October 4, walking up the birds without any dog but a retriever. In 1850 much the same sort of thing could be done, as was shown in Mr. Osbaldeston's match against Mr. Crawford—the latter conceded twenty brace, as he was twenty years the younger man. The first day each shooter got eighty brace, and the next day Mr. Crawford scored 102 brace against the thirty brace of his elder opponent. At Buckenham, in Norfolk (Lord Ashburton's), 314 brace were killed by eight guns in 1858, and 332 in 1859—good work for walking in line. The shooters were using muzzle-loaders. Lord Coke is much in favour of driving partridges as a means to preservation, and he supplied to Mr. A. Stuart-Wortley the record of the best two seasons at Holkham under both systems.

These interesting records are as follows:—

Walking, 1868	-	-	-	-	3,308	partridges.
„ 1869	-	-	-	-	3,385	„
Driving, 1885	-	-	-	-	8,100	„
„ 1887	-	-	-	-	7,512	„

The differences between grouse bags of old and of late are even greater, especially in England. Colonel Hawker killed a few grouse in the North of England, but he was never a regular grouse shooter, and the best records over dogs were made, not in England, where driving has so vastly improved the stock, but in Scotland—in Perthshire—by

Colonel Campbell of Monzie, who is said to have killed 222½ brace in one day, and the Maharajah Dhuleep Singh, who is known to have accounted for 220 brace in the day, when shooting over dogs, in 1872, on moors on the Tay, near to Aberfeldy. It is very doubtful whether this will ever be done again, for driving has so changed the habit of the birds that the thicker the game the fewer shots can the sportsman get over the best of dogs. Much as we like shooting over dogs, we have seen the grouse unapproachable, on some of the driving moors in Yorkshire, even before the first of August — packed already. On several of these occasions we had crack field trial dogs with us, and we can answer for it that we would rather not shoot at all than be compelled to shoot grouse over good dogs in such circumstances. The objections we have are two: first, you are fooling the dogs; second, you are driving off a hundred fine birds for every shot that can be obtained at a cheeper. Now, under driving, the Yorkshire moors will produce nearly a grouse to an acre, and sometimes much more, as when, in 1872, Sir Frederick Milbank's party killed 17,064 grouse on the 12,000 acres at Wemmergill Moor.

Of individual performances we have plenty of records of late years, but very few old ones with which to compare them. Lord De Grey's 240 partridges in one drive will long hold the record, we fancy. This was performed in 1893 on the late Baron Hirsch's property in Hungary, and the same grand shot killed in a single drive 128 grouse at High Force as a guest of the late Mr. Clare Vyner. Sir Frederick Milbank, however, killed 190 grouse in a single drive during his great day in 1872. In a day we have three great performances to remember—Lord Walsingham's 1,056 grouse in 1888 (shooting alone); Sir Frederick Milbank's 728 grouse in eight drives, shooting with his party at Wemmergill in 1872; and the Maharajah Dhuleep Singh's bag of 780 partridges to his own gun at Elveden on September 8, 1876. The record bags for a party of guns, as far as we know them, have been as follows:—

Mr. Rimington Wilson, on the Broomhead Moors, near Sheffield, nine guns, August 20, 1893, 2,648 grouse.

Lord Ashburton, six guns, at The Grange, Hampshire, in 1897; November 4, six guns, 1,458 partridges.

It may be of interest here to recall the phenomenal partridge bags made on Baron de Hirsch's foreign estates in Hungary during the season 1893. On the Eichhorn estate the total bag of partridges from September 1 to October 5 was 22,600: the best day 1,326, with eight guns. On the St. Johann estate, in the same year, from October 6 to November, 26,605 were brought in, without the pick, which must certainly have been considerable after such shooting; the best day during the month being 2,983 (all grey partridges, no red-legs), killed on October 11 by seven guns. The shooting team was a picked one: Earl De Grey, Lord Ashburton, Lord Chelsea, Messrs. B. H. Vane-Tempest, Henry Chaplin, Seymour Finch, and their host, Baron de Hirsch. We have in this case the extraordinary number of 49,205 partridges killed on the estates of one proprietor in two months and one week.

The pheasant is entirely artificial as a game bird. Not only man's preservation is necessary in his case, but man's means of incubation, and the common barn-door fowl is the mother of more pheasants in a year than the hen pheasant herself hatched out in a century. Nearly all the big shooting estates now rear thousands where they before reared hundreds; or, at the time the Queen came to the throne, reared none at all by hand. Sixteen thousand pheasants' eggs under hens have been constantly put down on one estate close to London, and we have no doubt that in many places this number has been greatly exceeded.

One of the game farmers told us that he expected to sell no less than a quarter of a million of pheasant eggs in the spring of 1897, and there is positively no limit to the increase of the number of these birds. But the increase is not general. Most of the land in England, to say nothing of Ireland, is but badly preserved, and much of it is not preserved at all.

The use of pointers and setters for partridge shooting has almost died out. It may safely be said that, in the south at least, sport over dogs with partridges can only be obtained

by one man at a time. Not in Norfolk, Essex, or Suffolk, but in any other county, we think we could make as good a bag over dogs as anybody, shooting alone without drivers or dogs, could make. But it all depends upon the individual dogs, and there are very few that could be trusted to serve the gun better than beaters could. The majority have not good enough noses. This is the quality of all others that has to be bred, and cannot be improved afterwards. Upon it every other one, from pace and style to breaking and temper, depends to a great extent. The want of it shows in a hundred different ways, often in flushing game, but far more often in false pointing—the latter the greatest nuisance, and kill-time, of all faults. For grouse shooting dogs are still a necessity on many moors. There are moors on which a shooter with dogs may kill twenty-five brace in a day, and see no more than fifty brace or seventy brace at the outside. Especially is this the case on some high moors we could name in bad or moderate seasons. Driving is out of the question on such places, for if a party of ten guns and forty drivers could be collected, which they cannot, the bag probably would not be greater than a single gun can get over dogs; and, if all the grouse that could be flushed by the beaters were killed, it would sometimes not reach fifty brace, and often not seventy brace. Such ground is to be found in most counties in Scotland, although the ability of the shooter to get near the few birds is not the same in each. In the islands of the West Coast, in Sutherlandshire, Caithness, and Argyllshire, this kind of shooting is to be had, and we need hardly say it differs from grouse driving absolutely. Indeed, the racing man and the grouse driver seem to us to have more tastes in common than the latter has with the man who plods after his dogs every day, bar Sundays, for from four to six weeks in the year, and walks between 900 and 1,000 miles for 300 brace of game. Once we asked a man of sixty-five why he walked so hard and ate so little, and his reply was that he liked to feel that he was in condition to go through a campaign. He never knew when it might be wanted. He was neither soldier nor Volunteer, but had all the spirit that makes gratuitous

fighters, and keeps alive the English qualities by which the Empire has been won.

I have purposely left out of my records the numbers of red deer killed by various sportsmen on the forests. Numbers prove nothing. It is impossible to know how the quality of the heads compare as a whole with the totals of other forests. The practice of taking the average clean weight of the total kill is excellent in itself; but what we look for more than weight is beauty and size of antlers.

If new inventions have made a gun a much more pleasant weapon for the user, and a more deadly for the game, nothing can exceed the beauty of some of the old work put into the flint-and-steels. Pistols, too, as made for the noble sport of defending honour, were works of art and tools of precision, as they ought to be when an owner's life practically depended upon their excellence. Egg could turn out such wonderful tools for his patrons, but in the absence of public competition, when the Army had to be armed by the Government, the "Brown Bess" was good enough. We suppose, because it not only had to defend the life of its owner, but the life of his country also.

The Brown Bess was a weapon that was safest in the hands of a good shot. Most guns are. But this one differed from most guns by the reason of its safety. It was safe never to put the bullet where the gun was pointed, so that a bad shot made the most dangerous enemy. From this to the match rifle, and to the .303 Enfield, or to the .256 Mannlicher, is an enormous step. Indeed, we do not know that anyone believes it possible to go much further in the improvement of rifles; the only possibility seems to be that of cocking and unloading by means of the recoil. Several such inventions have been made, but at present they have not been practically adopted except for pistols. Perhaps the finest shooting ever done at the target was done by Captain Gibbs, at Wistow, when, on October 11, 1886, he placed forty-eight out of fifty shots in the three-foot bullseye at 1,000 yards range, the two other hits both being within six inches of the bull.

This was done with the 461 Metford match rifle, Curtis and Harvey's No. 6 black powder, and the 540 grain bullet.

From about 1850 to 1870 the shooting of game, especially in Norfolk partridge fields, was brought to great perfection by the rapid change of guns when a covey of partridges was walked up by the line.

A correspondent in the *Badminton Magazine* says :—

“I am not exactly ‘recent’ myself, as may be gathered from the fact that I remember a day at Diddlington with Wilson, George Hanbury, and Sutton, then the Norfolk cracks, and a morning at the Red House, Battersea, with Huntingfield and Crawford at forty yards rise and ten bores; that I saw the match at fifty double rises between the former and Capps (Gannon) for £1,000, and heard the betting of 3 to 1 on the gun at both—which was justified by the scores of each, the loser killing 92. These events take us pretty far back into the past, and I am inclined to think that the shooting in these cases has never been beaten, either in the field or over the trap.”

It is well in these days, when we do everything so much better than our elders, to be reminded that they could shoot even then.

“Of my own deeds with a gun I do not wish to say more than this, that I never in my pigeon-shooting days (which were not long) lost an important money match, the record performance being a total of twenty-one kills to two misses, at forty yards rise, against a then well-known Russian shot, and Sir F. Sykes, twenty-four birds (the last unshot) for 500 louis, a great deal of money depending on the event; and I may perhaps mention, a good many years after, as a veteran, winning the cups of the Lords and Commons' match three years in succession without a miss. In modern times I have seen some good shooting by English and foreign shots, but as the gun is now held to the shoulder no comparison can be made. Among these, however, I consider that one only can be classed as extraordinary, viz., the Frenchman, Lafont, who killed thirty-four birds in succession at thirty metres in a heavy money match against Walter Blake, and something like ninety out of the hundred in the rest of the match. This man was probably the finest pigeon shot who ever lived, and held his gun fairly enough. My own experience over the trap did not extend beyond a few years, and it is certainly of shooting in the field that I prefer to write.”

Of shooting in the field this correspondent says :—

“In Suffolk, if the number of birds was smaller, the variety of shooting was much greater, owing to the fine extent of heath and the red-leg partridge, at that time almost as numerous as the grey-bird. Nothing, I think, could be finer than a walk with two other guns over one of these moors fringed with corn land, as on Rushmere or Rendlesham. That this shooting is far more difficult I have always been convinced, for I have never seen more than half a dozen men who could take their doubles at long rises in the form necessary to make a bag in November in wind on a wild heath. To this, uncertainty of footing, arm-weariness, and fatigue contribute, as well as bad light, for the low shots if the day is dark.”

That is a remark that we have frequently made in *Land and Water*, and, although it is the fashion to talk of driving shots as difficult, by comparison, we are not able to agree.

“For this shooting the detonators were good enough, and four birds would often be got out of a covey. In a match at Six Mile Bottom against Captain Alexander I once got twelve birds out of three lots; but these coveys crossed the line of fire. The bags made were not so large as are now recorded, and 100 to 120 brace was considered good work for three or four guns; though I have known 200 brace thus bagged, and on several occasions I got between sixty and seventy brace myself when in line with other guns. Of these 69½ was the best, on November 21st, 1860, 165 brace being the total bag to four guns. Partridge driving had begun nearly ten years before the advent of the breechloader, principally in Suffolk, and mainly because some of us were growing older, and found the red-leg partridge almost impossible to get at by walking. At first we stood close under the hedge and shot the bird after it had passed, but on the heath it was found much easier to take the forward shot first. Once established, it very soon became a recognised form of sport; and although the Norfolk cracks would have none of it, and the fogies shook their heads, it came and conquered from the lighthouse at Dovercourt to Cromer Point. At first it was considered very difficult, and confined to a very few, as a really high art; but as it really required nothing but practice, a few years sufficed to bring into line a great number of men who, although not very quick, would miss no great number of those they shot at.”

The old-time gunner can give a few useful hints to the younger generation also. He says :—

“In game shooting the usual fault of inferior shots is waiting too long on the first bird, which should be snapped at thirty yards

off or on sight. They then turn round, the true focus of the eye is thus lost, and with it the chance of the double. Another fault is firing at the same bird twice—after a miss—which should never be done, for it causes uncertainty in respect of the second barrel, and a momentary delay to see the effect of the first shot. A man who gets into these habits will never reach even second class in form, or do what he ought to fill the bag. I have heard it objected that to scramble down the greatest number of birds in the shortest time is not the highest class of shooting; nor perhaps is it. It is like the spot at billiards, and apt to be accompanied by a similar loss of power all round if practised too much; but it is the fashion of the day, and the best shot will be the man who can get down the most behind a hedge or a butt."

CHAPTER II.

SHOOTING SCHOOLS.

OF late it is becoming the fashion to turn gun-makers' shooting grounds into what are called shooting schools. We are not inclined to accept these schools as different, except in degree, from the old form of gunmakers' grounds. The difference between the school, on the one hand, and the old-fashioned fitting-range on the other, is not, in our opinion, one that has introduced practice for the accomplished sportsman, although we know that a few of the best sportsmen and shots have used the clay-bird towers for practice, for arm exercise, and for the cultivation of rapid changing of guns. We are aware that crack shots at clay birds extol the difficulty of it as beyond that of live pigeon shooting. But the whole objection that can be urged to it is not summed up in its greater, or less, difficulty, but in its difference from living game.

We have avoided regular practice at clay-bird shooting for two reasons ; first, because we wished to remain impartial to every new phase of practice with the gun that might be brought out, and try it as a game-shooter only, and second, and of much more importance to ourselves, but of none to others, because we feared that it might spoil our shooting at game if we made a regular practice at it.

In America clay-bird shooting is a sport in itself. It is not so here, and we do not think it can ever become more than a means to an end in this country, although it is an end in itself in America. What is the end, then, that is possible to get out of practice at clay birds? We have instances where a good pigeon shot has been formed out of a clay-bird shot. We do not know of a single instance

where a first-class game shot has been so formed. Pigeon shots were usually good game shots—we think that they usually are so now; although we are well aware that the practice of dropping birds close to the electric traps is as different from game shooting as the former is different from clay-bird shooting. There may be improvements later on, such as will bring clay-bird shooting nearer to game shooting than it is at present. We think that the greatest possibilities for it consist in the high, overhead and coming, shots thrown over tall trees; but, as far as we are able to judge, these are not very good imitations of the flight of pheasants, partridges, or grouse yet. We think that the cause of this is that the clays go like a flash from the traps, and begin to slow down their pace at once. No doubt if the shooter stands close up to the trees they come fast enough; but then they are not visible long enough before the shot should be fired to enable the shooter to do with his gun what he does at game. There is, for instance, no possibility of swing when the game is over the gun before it is seen. Then, if he stands further back, the slowing down has taken such effect that no “swing” of the gun is necessary. Stronger springs, and the guns placed further away from the point of departure of the clays, might meet these difficulties somewhat, but at present we have never seen a clay thrown overhead that tested the sportsman’s ability to meet and overcome actual pace. We must repeat here that we are not talking of snap shooting. Snap shooting is one thing the killing of down-wind pheasants, grouse or partridges, has nothing necessarily of snap shooting about it; the best game shooting is not the most difficult, for there are shots, and stands, that are impossible. We have been posted under the brow of a hillock within twenty yards of the first sight of the grouse, and in such a situation, when a moderate wind has prevailed upon the flat, the draught created by the shoulder of the hill has brought the grouse far past our heads before we could put in a shot, and we have then found that the only plan was to turn our backs on the coming grouse and try the retreating shot—never very satisfactory; and the faster it is the worse it becomes,

because it leads to more wounding. The most difficult possible shots (other than chance shots), then, are where the shooter sees his approaching game at from forty to seventy yards away, and when a real good wind is behind it. Under such circumstances he sometimes does not see his second bird until after he has fired his first shot. In the case instanced there is but one difficulty to contend against; it is one that game shots, during the past twenty years, have set themselves to deal with. So much is this the case that a good shot will measure the pleasure of a day's shooting precisely by the pace at which "possible" birds come for him. He might get snap shots at his birds by going in near, as in the case where he sees his driven game for the first time some twenty yards in front, but when game is going some sixty miles an hour (an average speed in the hills, whatever may be the case on the flat moors of Yorkshire), no amount of snap-shooting practice at clay birds will help his bag very much in such circumstances. We have it on the best of authority (measurement and scientific calculation) that when a grouse is going from forty to sixty miles an hour an allowance must be made, according to its distance from the shooter, of anything from 2ft. 4in. at fifteen yards away, and forty miles an hour, up to 23ft. in front of the game that is travelling at sixty miles an hour and is sixty yards off. Does any snap-shooter in the world believe he can estimate 23ft. even on a still surface at a guessed distance? If he does, and will try, he will soon be convinced that it would be absolutely futile to begin to guess distances of this kind in front of grouse going at the speed indicated above. No man can guess the distance of a thing in the air with any certainty whatever, and a mistake in ten yards means a difference of "allowance" of 4ft. 6in. at sixty yards, at the speed of sixty miles an hour. No man can guess the allowance to within 15in., which is all the permissible error allowed in a spread of shot of 30in. in diameter. No man can guess the pace of a bird coming over him.

Yet successful snap-shooting pre-supposes not only one, but all, of these three guesses being accurate.

We know the utmost pace of a rabbit, and we know that of a clay bird, and in each case we can pitch up our gun and shoot a yard or so in front with pretty certain results without any sort of swing or jerk, or even going with the game physically or mentally. But this does not meet the problem of the differences of pace and distance of winged game, and a system that teaches the snap shot, when applied to pace, and nothing but pace, in game is liable in our opinion to come to lamentable grief.

There are good shots who are entirely unconscious of doing anything more than putting up the gun before the game and firing; but if their guns are watched they will be observed to tell a very different story. It is not necessary that "swing" should be done after the gun is at the shoulder, but we are assured that, in some form, swing, or going with the game, is necessary to the successful shooting of all very fast shots. We do not say for a moment that swing, to be successful, must not be combined with judgment of pace of the game, distance, and allowance. We believe that it is generally so combined, for we do not think it would be easy to swing as fast as the game flies without at the same time swinging faster.

For practical purposes in connection with this matter of "swing" the shooter is a pivot round which his gun and the game are travelling. If, therefore, the alignment is kept upon the game, it is obvious that the gun muzzle is travelling very much slower than the game, as it is nearer the axis round which both are travelling. We do not know how quickly a man may be able to move his gun, but if he could make his muzzle move as fast as his game, it is obvious that he reduces "allowance" to a question of inches instead of feet, as he would give a sideways motion to the shot as it left the muzzle equal to that of the game. But if anyone tries this he will find that a tremendous jerk is necessary. The usual practice of those who jerk is to get the gun aligned with the game and then to jerk. This does not, of course, necessitate so much pace in the muzzle of the gun as has been contemplated above; because the gun jerked in front of the game is an equivalent to more,

or less, allowance in front, as well as effecting a variation of the direction of the shot in the way the game is going. To test the pace of the gun against the pace of the bird it would be necessary to come from behind up to the alignment with the game, and then let off without stopping the movement at the instant the gun passed the game. We believe that anyone who tries this upon really quick grouse will find that it cannot be done, which means that it is impossible for a man to move a gun muzzle at the rate of forty or sixty miles an hour.

We think we have made it clear that the absolute judgment of distance necessary for "allowance" in front of the bird is impossible, and that swing or jerk at the rate or speed required to make allowance unnecessary is also impossible, and therefore we have a right to assume that to become a good shot at really fast game one must race the bird with the gun, in some way; that is swing or jerk according to, and set by, the pace of the game, and make allowance according to judgment also.

We have said nothing about "personal equation" and the time the shot takes to leave the barrel, because, although these troublesome factors may mar the progress of a bad shot, a good one, such as we are considering, has learnt to "time" himself necessarily, or he would not be good. He and his gun are in touch, and he does not pull his trigger when he is satisfied with his aim, but the instant before, when he sees that he is *going* to be satisfied with his aim. To prove this it is only necessary to point out the many times a good shot will fire at a bird another has killed before the good shot has pulled trigger. The latter will admit at once that the bird was dead before he pulled. It is obvious that if the muscular movement to pull the trigger was initiated after the aim had been got it would not be pulled at a dead bird.

The object of "swing" is to reduce the necessity of accurate judgments of speed, distance, and to some extent of "allowance" to their equivalent by means of a very simple physical movement. This latter "swing" or "jerk" is assisted by more or less "allowance," the latter varying

little or nothing with the pace of the game for similar distances; not varying, because the speed of the gun varies according to the speed of the game, and should be set by it. We shall perhaps be told that this is the condemned practice of following the game round, but really we need hardly say that it is nothing of the kind. We would rather call it hastening to catch the game up. We do not think it necessary that the muzzle of the gun should travel far; perhaps only inches, perhaps feet; but travel it has to, not necessarily when at the shoulder; perhaps when coming to the shoulder.

In order that "swing" should be possible there must be a considerable length of time elapse between first sight of the game and the shot, and this necessity has hitherto beaten the advocates of clay bird shooting. They cannot give a good long sight of a quick target. They can give you a quick target overhead, and they can give you a good long sight at a target overhead, but the two cannot be, or rather have not been, done together. When one occurs the other is absent.

It will be observed that shooting schools have their limitations therefore; they are not so entirely stock-fitting grounds as they used to be, because it is possible to train shooters up to a certain point at them. We are, however, inclined to doubt whether the majority of them begin in the right way. We do not believe in the teaching of snap shooting as an early lesson, and yet most of the arrangements are made specially to teach snap shooting, or else no shooting. It is easy to understand why gunmakers prefer to test for bend and cast-off and length of stock at snap-shots. They must do so in order to get rid of the possibility of the shooter bringing alignment to the correction of his gun-stock. It is, however, one thing to say that snap-shooting is right for stock-fitting, and another that it is the primary necessity for a shooting school, in which one of the essentials is practice with a stock that does fit. Snap-shooting, as a lesson, should not, in our opinion, ever be given until after the pupil is perfect in every other form of shooting. It is the most difficult of

all; something has to be done that is not necessary in any other kind of shooting, and we say it should only come last, because great experience is necessary to accurate judgment in throwing up a gun and firing into space, or thick bushes, a guessed distance in front of game you possibly cannot see at all when you shoot.

Clay-bird shooting is snap-shooting, but the snap-shots are of an easy kind, and it must not be supposed that being able to pitch up the gun in front of the clay and breaking it, in style, would indicate the possibility of slaying a black-cock gliding over a few feet of ride in a Scotch covert at an apparently quiet pace of fifty or sixty miles an hour. If snap-shots at the clays could teach this, we should have no word of praise high enough for them.

We fancy that the person who started out to learn shooting by practising such snap-shots at clays would be very uncertain, and have no chance of improvement. Everything now, in the actual sports of the field, depends upon speed, in shooting. The modern gunner is unhappy unless his skill is tested by speed—tall pheasants, because when they are tall they are fast also, and grouse and partridges driven down wind—that is the fashion, and it is useless to oppose fashion unless you are prepared with a new one and a better. It is, therefore, somewhat out of the fashion to talk of practising for game shooting at clay birds, more especially when the latter are not thrown overhead. We agree that something may be learnt at them, provided an expert stands by to tell you exactly where you shot on every occasion, and why you shot there. This, however, has nothing peculiar to the shooting school about it, and is just as easily done at game. It is the expert that does the work, not the appliances, in both cases.

If you are a good game shot, you will probably shoot much too far ahead of clay-birds thrown overhead, for the reason that you judge their speed before you shoot, and they are slowing down all the time. It becomes a question whether, this being the case, it is good to go on practising at them. It is obvious that if you learn the trick of them,

you must not apply it to living game, or you will assuredly shoot behind it.

But there are, all the same, many bad tricks in shooting that a really clever on-looker can find out by watching a very few shots, whereas the shooter himself might shoot on for years without being any the wiser. In the first place, an expert is no use unless he can see exactly where his customer shoots in respect to his game. [Here, we should remark that, unfortunately for the experts, most men who miss much never miss twice alike. What is the unfortunate expert going to do in such a case as that?] It is the opinion of Mr. Purdey that the try-gun is no good, and he gives as a reason that when it is thought that an error has been detected in stocking, and better work is being done, then suddenly, for some unknown cause, it happens generally with poor shots, that they do exactly the reverse of what they have been doing, and the try-gun has to be altered back again. This up and down work will proceed a whole afternoon, and five hundred cartridges have been known to be uselessly expended in trying to get the shooter to mount his gun twice alike, or to pull the trigger twice in the same time.

Everything, or nearly so, as we have explained, is laid out at shooting schools in order to find the right bend and cast-off to give a man. That is not everything—use will make a man shoot well with nearly any stock, provided that he has shooting in him. A constant change of stock is never advisable, and it is far better to stick to a stock that all the experts declare manifestly wrong than to change from that which long custom has made successful.

Although fit of stock is so much talked of nowadays, there are some points in shooting lessons that we hear far less about than we used to forty years ago. And yet we venture to say that some of those are of much greater importance to a shooter than shape of stock, because the latter depends upon the habit of the shooter. The first of all is the teaching of how to throw up the gun so that it invariably comes exactly in the same spot with neither bump nor jerk; the second is to pull the trigger before

the gun touches the shoulder, so that the shot shall leave the muzzle as the butt comes home, and before reaction or jerk takes place. The third is the cure of gun-shyness, a fault from which most bad shots suffer as well as all beginners. Gun-shyness may show itself in nothing more than blinking the eyes, but it frequently effects a movement of the body, also, out of keeping with the idea of good shooting. These appear to us to be the elementary lessons for a shooting school to teach even yet.

We would make one other observation, and it is this : that we do not agree with the statement that all the aiming should be done with the left hand. There are fashions flying about, the result of hearsay evidence. But if anyone wishes to discover that the right hand is of use in aiming, let him try to aim at a rocketing pheasant with his right hand in his pocket and a string attachment to the trigger. We will undertake that he will not kill his rocketers in his best form, and we shall be prepared to bet on the bird every time. Another mistake is the forward position of the left hand for every person alike. It is very excellent for pigeon shooting, whence it came, but everybody, and every shooting school, will do better by studying varying length of reach than the pictures of other people's ideals. All men are not cast in the same mould ; and it is obvious that a broad chest gives less forward reach, when both hands clasp the same object, than that permitted by a narrow chest.

CHAPTER III.

THE FORMATION OF GUNS.

THERE are many more things to look for in a gun than pattern and penetration --- none of them any more accurately measurable than are those two good qualities. For instance, one of the worst faults that can be found in a gun is a round instead of an oval handle. Even if the formation of peculiar hands enabled a shooter to handle the round as comfortably as the oval handle it would, none the less, be a bad fault, and perhaps a worse fault, because of the comfort of handling it. We have already dealt with the limitations of the clay bird as practice for game shooting, and before we get on to the shooting schools and the views of their exponents, and the value of clay birds to first beginners, we have a few words to let off about the relations of the gun to the eye, lest we are misunderstood when we come to the recommendations of various experts of the shooting schools. It has been said that it is impossible that the left eye can align the barrels when the gun is at the right shoulder. This is true; but to argue therefrom, as has been done, that it is impossible that the left eye can control the aim is entirely wrong, for it is a thing that is recognised and cured constantly at the shooting schools.

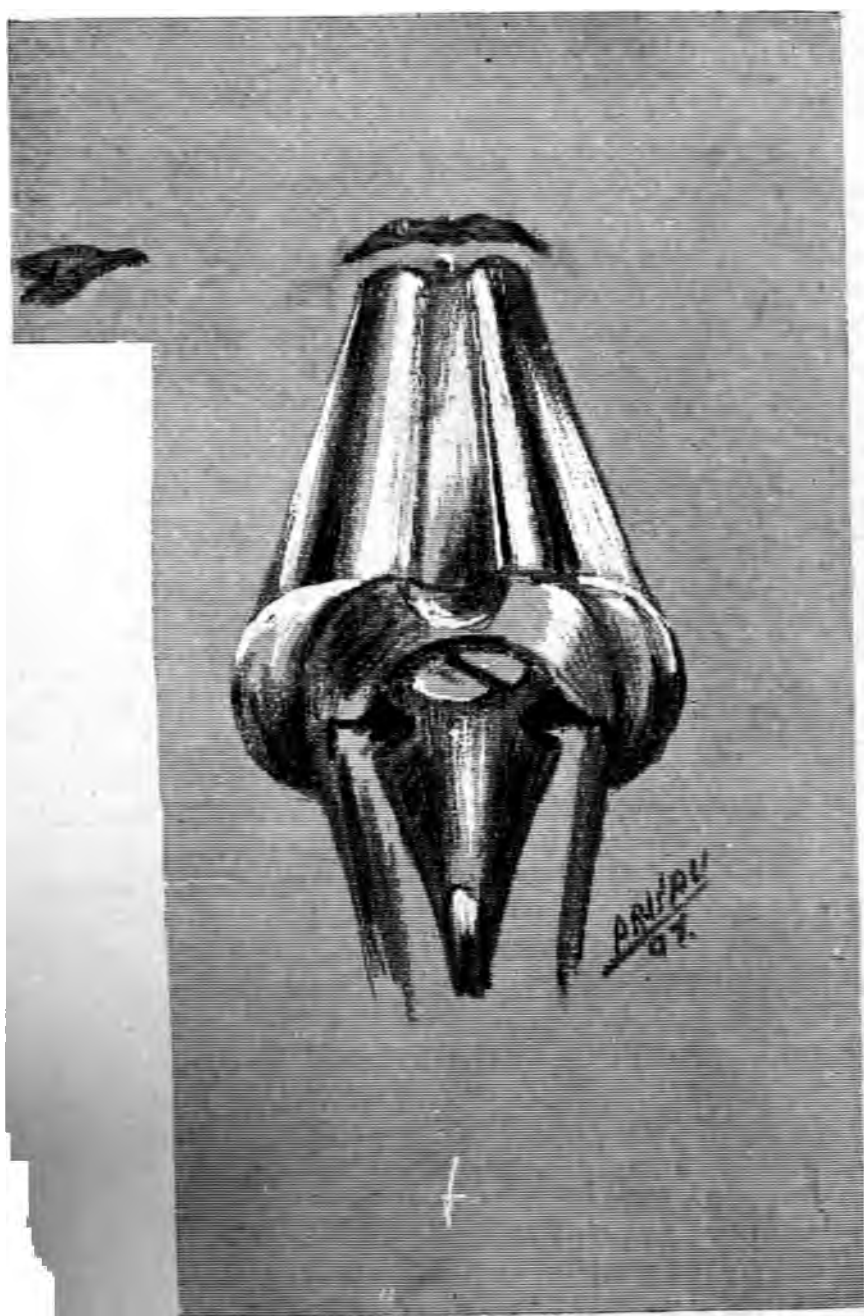
It is one of the most difficult things in the world to discover what part of vision each of two eyes are taking. So much do they work in unity that they can only be separated for theoretical purposes. When a shooter fires at a coming pheasant overhead, that is a rocketeer, he can do one of many things. He can take a line well above the breech of his gun and place the bead on the pheasant. He will then be aiming very much in front of the bird and yet keeping it in sight with the alignment eye.

The appearance of the gun to the shooter will then be as in Fig. 1. That is, he will see the rib from beginning to end. But if, on the contrary, he shoots with his head well down, and the appearance of the gun is simply the false breech and the foresight, as in Fig. 2, he will not be able to see the approaching pheasant with his alignment eye. Yet he will, nevertheless, if he can shoot with both eyes open, be just as well able to see the pheasant as if he aimed as in Fig. 1. Of course the coming bird is only visible to the left eye. Some years ago Mr. Lowe, of the Queen's Westminster Volunteers, surprised the Edinburgh shooters by shooting well at the targets after totally blocking out the sight of them from the right eye. He aligned the barrel with the right eye and placed it on the target by means of the left. This was nothing more than many a game shot does every time he shoots a certain distance ahead of an overhead bird, having aligned the gun as in Fig. 2. What the shooter really sees is not material; what he appears to see is the pheasant *through* the gun, as it is shown in Fig. 2, and he can measure the distance that the bead is in front of the head of his game as accurately as he could if his gun were transparent glass.

One advantage of this method of alignment is that it is equally good for the coming bird seen, as it were, through the stock, as it is for the crossing bird seen with both eyes. There is no elevation given without intention, as there is by the methods shown in Fig. 1, in which the gun is making allowance for the oncoming bird, and is really aiming at the \times above the sketch, which is obviously wrong for the crossing bird.

There is much more to be said on this subject, especially as to the method of testing the eyes to see whether they really accomplish the true unity; but it must be deferred, for it hardly comes within considerations of the shape of the handle of a gun.

If it is so easy to do this apparently difficult task with the left eye, it is surely easy to place too much trust in the left eye without knowing it. To believe, in fact, that the right eye is aligning the gun and the game when, in fact, the

X**FIG. 1****ONE METHOD OF GIVING ALLOWANCE.**

left eye is aligning the sight and the game and the right eye is aligning the breech and the sight. Two alignments at cross purposes result from this optical possibility, and we



FIG. 2.
APPARENTLY SEEN THROUGH THE GUN.

will say probability, in spite of the fact that some people consider it impossible. It is no uncommon thing in the experience of that very practical teacher, Mr. Watts, of the

London Sporting Park, to find one man shooting a yard in front of *every* bird going to the left and a yard behind every bird travelling to the right. He explains it as the unconscious use of the left eye in aiming. Moreover, we know one crack shot who, figuratively, failed to hit a haystack until he closed the left eye and became a first-rate man with the gun at driven game as well as at pigeons. Some people will tell the shooter that alignment is all wrong in game shooting, but as a matter of fact all the crack shots do align the guns; and so those people who tell you that the head should be straight up, and that you should shoot on the principle of the billiard player, the catch at cricket, or the slogger, have yet to produce their brilliant examples. By alignment we do not necessarily mean that the shooter should be conscious of looking at the gun. He should bring the gun up, though, in a way which enables a true alignment, although it may not be necessary to take it. The man who does the reverse may be an excellent man at tumbling blue rocks on to the electric traps, but he will assuredly come to grief over driven game.

There is so much in game shooting that is necessary to be done that never troubles the thoughts of the pigeon shooter. That has been denied by the advocates of the traps; but let us see. A pigeon gun is usually set to shoot somewhat high at forty yards. It is an excellent fault, if that be not a paradox, but still a fault in a game gun. Let us suppose that the pigeon shooter, for his always rising bird, shoots in the manner shown in Fig. 1—that is, he relies upon the sight of his rib to give the necessary elevation. (This is, in fact, the origin and cause of the straight stocks that were everywhere fashionable twenty years ago.) He will get on excellently, as we have said, at straight overhead shots; but what happens with horizontal crossing birds, or even those beautiful easy birds and difficult shots that slide down in a gentle curve upon motionless wings after having got the elevation and the pace hundreds of yards in front of the guns? In Fig. 1 we have shown a crossing horizontal bird intended to be going in a direction to bisect the alignment of the gun. He will not do so, for

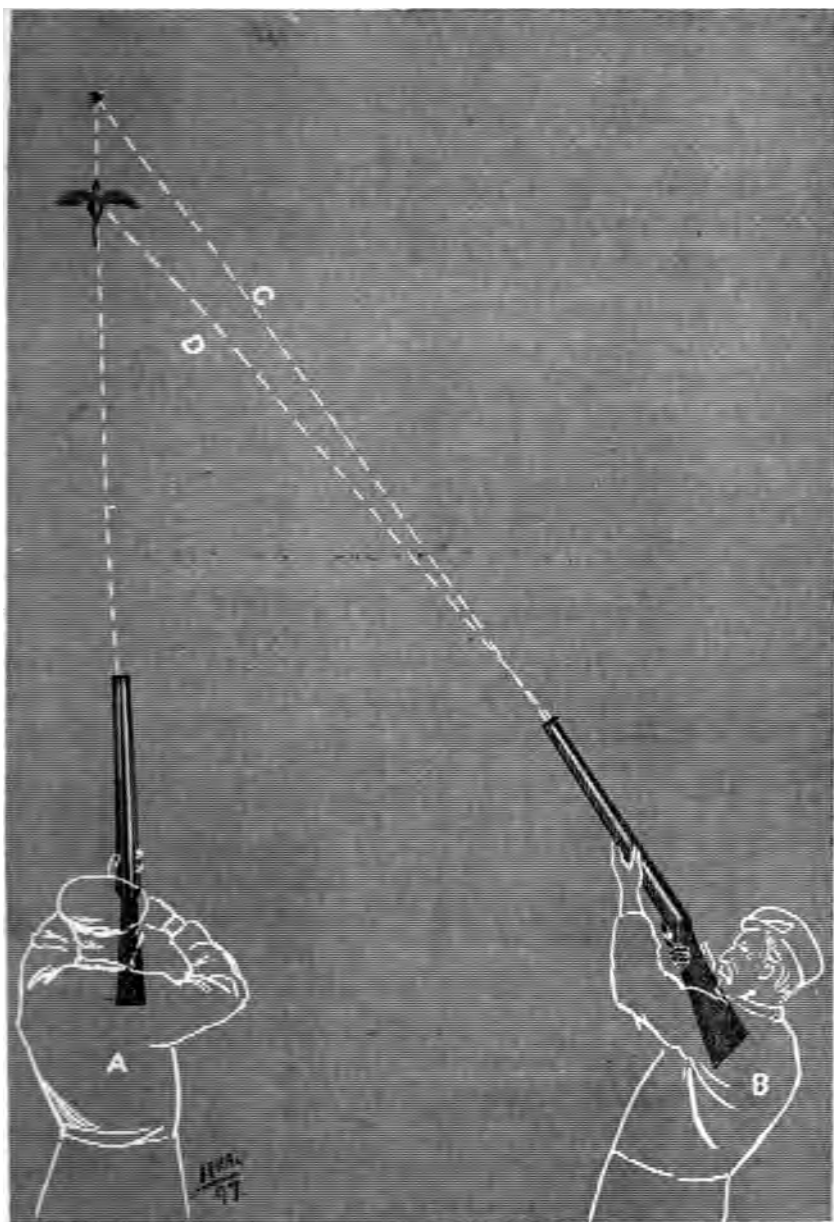


FIG. 3.—The angle is exaggerated of necessity to get the picture in the page. The bird is supposed to be 35 yards in the air, whereas the men A and B are within 5 ft. of each other. C shows the direction of the shot from B's gun. D shows the line of aim of B's gun.

the barrels are erroneously pointing several feet above him, just as they are, rightly enough, for the incoming bird. For this reason we do not believe in this method of shooting with the head high above the breech end. A system that is right for one shot and wrong for another leaves too much for mental calculation at the supreme moment, especially when birds are coming twenty to the minute. At Fig. 2 it will be observed that this calculation is made unnecessary. Allowance, swing, or jerk is the same for the crossing as for the incoming birds, and it has to be made equally in each case. But there is a similar error of shooting possible to the man who aligns as in Fig. 2. It is caused in this way. The breech end of a gun is very much thicker than the barrel at the muzzle, and the rib at the false breech is nearly a third of an inch higher than at the sight. This has to be so to make up for the drop of the shot by gravity. It is on the principle of the back rifle sight. And the sighting is intended for thirty or forty yards, at the option of the gun-maker. Gravity affects the shot by from six to twenty-four inches at various shot-gun ranges, and the rib at the breech is raised above the line of the internal surface of the barrels in order to counteract this gravity. But there are positions in shooting in which gravity has little or no effect on the direction of the shot. The exactly overhead shot is one of these. It follows then that if a man stood sideways to the flight of the bird and held his gun as in B, Fig. 3, he would be making the full allowance for gravity to act on direction of shot; when in fact it would not so act. Whereas, if he faced his game as in A, Fig. 3, the allowance that the gun-maker has given for gravity would result in so much more forward allowance in the right line of the game. Not in distortion from the line of the game as in B, Fig. 3.

B, in Fig. 3, is not drawn to show the sideways shot at a bird exactly overhead, but to show a frequent attitude at a common angle, in which the centre of the shot would pass on the shooter's side of the game, *i.e.*, over it, resulting in a winged bird or a clean miss, even if swing and allowance were perfectly correct.

It follows upon geometrical calculation that a gun handle



FIG. 4.

TILTED OVER, ALIGNING CORRECTLY, YET SHOOTING TO THE LEFT.

liable to twist round in the hand is the worst possible form. It has two faults—it is liable to twist the gun off the alignment at the breech end without the shooter knowing the difference. That is so easily tried that we need neither to explain the cause nor show the effect ; but the certain result, even if the alignment is kept true, is to throw the allowance that the gunmaker has given to counteract gravity in a direction that does not counteract it at all or only partially does so.

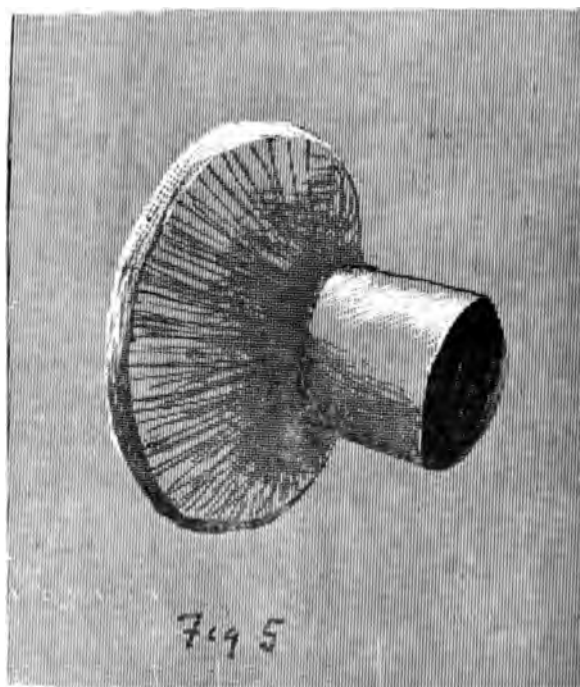
Thus in Fig. 4 we have an overhead partridge properly aligned by the eye along the rib and sight of the gun, but the twist over to the left of barrels results in the gunmaker's elevation for gravity making the barrels point to the left, so that the shooter really hits point C, and misses his partridge. This is a point mentioned by Mr. Stuart-Wortley in one of his books ; it is one also on which Mr. Watts, of the London Shooting School, is very particular, and one that can be best appreciated by firing a few shots at the target with the gun twisted. No man who has once done this, as we have over thirty years ago, will ever again doubt the value of an oval handle to his gun.

After writing this paragraph Mr. Watts wrote to us to say that he generally found a twist over such as that shown in Fig. 4 carry the shot to the right and high of the game. That is so, no doubt, because few shooters do properly align the rib when the barrel is tilted, but, as a rule, by tilting the gun without knowing it, they align the right false breech with the foresight and the game. We are not in this article dealing with the faults of shooters so much as the faults of guns, and we began the explanation of Fig. 4 by saying : " Thus in Fig. 4 we have an overhead partridge properly aligned by the eye along the rib and sight of the gun." We are, all the same, very much obliged to Mr. Watts for calling our attention to a habit of shooters that causes more missing than almost anything else. The pressure of the cheek upon the stock of a gun twisted over to the left serves to align the right false breech and the foresight with the eye ; consequently when this happens, as Mr. Watts truly says, the shots are carried to the right and high of the object.

Unfortunately Figs. 1 and 2 not only represent what the eyes see during a proper alignment for approaching overhead shots; but they also represent the appearance of a totally wrong aim already spoken of. If by chance the bead or foresight covers the point of aim in a direct line between it and the left eye, while the right is engaged in aligning the rib and the foresight, the appearance to the two open eyes (or rather to the brain) is the same as if the left eye was merely acting for the right and placing the foresight exactly between it, the true alignment eye, and the game. There is a different appearance to those who know how to look for it. Those who always see two sights when they focus the game, or the point of aim in advance of the game, will when the aim is wrong see the second image of the foresight to the left of the object of aim instead of to its right. But we think that practically this difference will not be recognised in the quickness of firing at moving objects; and the real effect of apparently seeing two foresights in wrong positions—of seeing the foresight with two eyes, not focussed upon it, but upon something further away—results in nothing more than a feeling of clumsiness. The shooter knows he has done something wrong, but cannot be certain what. The accident happens so seldom to some shooters that it may not be very material, although nobody likes to shoot six feet to the right or left of his game, even upon occasion.

But if the left eye is always inclined to do the work of alignment the case is very different, and the accident will occur frequently. By the optical delusion of two sights, when both eyes are focussing an object at a distance, we imagine it would be possible to learn to correct such errors as a master left eye would cause to occur; but, if so, it would be too late; the correction for the first barrel would occupy as much time as would otherwise be sufficient for the two shots. Correction of the gun at the shoulder, therefore, is out of the question, and means must be adopted, when the left eye too often governs, to prevent it from seeing the sight at all. This is to be done in many ways. Mr. Watts, of the London Shooting School,

believes that the left eye should also be prevented from seeing the game; although we rarely disagree with his view, we do so here. If Fig. 2 is examined it will be obvious that if the left eye could not see a straight-over rocketeer then neither eye could see it at the moment of firing; and we cannot believe that this would induce accuracy of allowance, not even if truth of line could be maintained, by means of a total reliance on swing or jerk. Years ago we had some doubt whether the left eye was not doing too much work in our own case, and for this



reason we had a thumb-stall made (Fig. 5) with a standing-up piece that prevented the left eye from seeing the sight, but did not prevent it from seeing the game.

There is no doubt, however, that the arrangement is not good enough for many whose alignment eye is distinctly their left. It would not, for instance, suffice to make us shoot well from the left shoulder and the left eye, we cannot

therefore suppose it would cure a converse case. But then would a block-out of the game as well as the foresight do so? We have tried it as an experiment for the purpose of this article, and we find that even when only the left eye sees the game and the foresight, yet the right eye is unconsciously dragging over the gun to the right; resulting in a curious bringing up of the gun between the two eyes; and in that after correction (that always takes too much time) in order to get a left-eyed alignment. Were we as much left-eyed as we are the reverse, no blocking out of sight of game or foresight would then suffice; and we should have to use a cross-eyed stock or else shoot from the left shoulder. We fail to see any objection to the latter; whereas the cross-eyed stock is a very unsightly affair, and clumsy in the extreme.

Whether the shooter uses his right eye and shoulder, or his left, there is always a danger of injurious help upon occasion with the other eye. This will occur not when he is bringing up his gun and practising quietly for quick alignments, but when, hot and tired, he is not himself, and is doing everything contrary or different to what he expects and hopes to do.

CHAPTER IV.

TWO EYES IN SHOOTING.

IN books on shooting, various methods have been given to show how a shooter may find out for himself which eye is the stronger. We do not think any of these are reliable for this simple reason, we have seen every one of them fail. It does not concern a shooter whether his right or his left eye is the stronger. What he wants to know is whether he constantly uses only one of them for the purposes of alignment. This is most important for him to find out. It is easily discovered, but the strength of the eye, as tested by an oculist, has not always anything to do with the matter. Some people have recommended that a ring or piece of paper with a hole in it should be taken in the hand, and brought into alignment with a spot in the distance, then the eyes should be afterwards alternately closed in order to see which of the two really affected the alignment. This is very well as far as it goes, but there are cases in which the right eye aligns for the right hand, and the left eye for the left hand. These tests fail absolutely then; and the only way is to resort to test with the gun itself. The want of knowledge that it, sometimes, makes all the difference which hand brings up the object for aligning is very likely to lead to error when the gun is not used.

We do not think the test reliable, even if a change of hand is made, and all objects prove to come up to align from the same eye. Even then it may turn out that the aligning eye is liable to neglect its duty when it is so situated that it cannot see the object aimed at, and the other eye can see it. For this reason we would suggest the following test, and we have found it unfailing, in order

to see whether either eye can, in all circumstances, be trusted to do the alignment. A bird passing straight overhead cannot be seen by the eye which aligns the rib and the sight at the moment of firing, because the gun will be in advance of the bird and will hide it from the eye of alignment. To a pair of eyes properly trained for shooting this makes not the smallest difference; strange as it appears to all who have not absolutely tested it, the left eye will bring the right eye (if that is the aligning eye), already aligning the rib and the foresight of the gun, into alignment with the game, or any point in front of the game that may be desired. The left eye moreover will measure the distance in advance, and keep the gun on the true line that the game is travelling, quite as well as if the right eye could see the object of aim itself. An easy test of this is as follows: get another man to face you four or five feet away, tell him to hold a sheet of paper so that he cannot see your right eye, but can only see your left. His right eye will now see your left, your left eye his right. Now bring up a gun or other object to the right shoulder and aim at his right eye visible to your left eye only. This you will align perfectly accurately with your right, although that eye cannot see the object of aim, but can only see the gun and do the aligning on your side of the paper, while the left eye carries on the process on the other side of the obstruction. Ask your assistant now, without moving his head, to shut his left eye and to remove the paper, and to see whether the object you aim with is in fact exactly upon the centre of your right eye, that is in a line between the right eyes of both. It will be so with anyone whose eyes are in the habit of right aligning with both eyes open, and if it should not be so then it is a hundred to one that the left eye does more than its share of work in alignment in the field, and a cure is required. All this kind of correcting work ought to be forthcoming at the shooting schools.

Put shortly, you must learn to accurately align with the right eye that which you can only see with the left. But in the field you have to do much more than this; you have to align with the right eye an imaginary point in front of

game that you cannot see with that eye; and this is much more difficult to those unaccustomed to it, and impossible for a one-eyed shooter. You not only have to find that line



A, holding paper.

B, aiming through paper at A's right eye.

PROOF THAT THE LEFT EYE CAN ALIGN ACCURATELY FOR THE RIGHT.

The right eye of the shooter cannot see the point of aim (A's right eye), and the foresight may also if desired be hidden from the left eye of the shooter, yet the aim will be as accurate as if the paper did not intervene, and the *visible* alignment will be equally perfect.

of flight with the left eye for the use of the right eye, but to keep the foresight in a direct line between the right eye and the line of flight of the game, as well as to measure

the distance in front for the right eye to point the gun, and all with the left eye. To a non-shooter it looks impossible on the face of it. To many a good shot who has done it unconsciously every time for twenty years it has come as news; but to those who have made the theory of shooting as well as the practice a thorough study it must be a commonplace we imagine.

We should add for the benefit of those who wish to try the experiment that, as in all shooting, in order to succeed the shooter must not look for his sight, but focus the object at which he intends to aim. If he once focuses his sight, the sensation of seeing the game through the gun disappears as if by magic. He must bring his foresight and rib, or the pointer he uses for the experiment, up to intercept his apparent line of sight from the right eye to the object of aim. As we have indicated, there can be no such visible line of sight when the gun is in advance of the coming game, or pointing over the mark on the target, but it appears to be there, and we have to believe the appearance, for whatever the explanation may be, the left eye does, as a matter of fact, assist the right eye to this extraordinary extent.

Here the unconscious work of the left eye comes to the aid of the shooter, who without an analysis would not know that the right eye was incapable of all the work that it appears to be doing. There be those who maintain that a similar action, one to the shooter's detriment, is impossible — that as long as the right eye is in line with the false breech at the rib and the foresight, an unconscious placing of the foresight by the left eye between it and the point of aim is impossible. Having the best of reason to believe that we have done this upon occasion we cannot agree. Indeed, the proof of the possibility of it is much more easy to understand than the converse; where the left eye aligns correctly the foresight for the right eye, and does so, whether or not the bead is visible to the left eye.

We never fail while experimenting to align with the right eye just over an object only visible to the left eye, as long as it is only practice. We find we cannot trick ourselves into going wrong, and yet, certain we are that

upon occasion, in actual work, looking between the triggers we have seen our game apparently aligned with the foresight, and yet the left eye has put the foresight on the object between itself and the game—not between the right eye and the game. We believe that the occasions when this has happened have been when the gun has been brought up so awkwardly that the foresight has been under the level of the false breech and the eye, and therefore invisible to the right eye, but clearly seen by the left. Certain it is that it is not difficult to deceive one's own optical intelligence intentionally by bringing up the false breech in this way—align it with an object, then by shutting the right eye without moving the head from its position of alignment, the foresight can be brought to bear on an object between it and the left eye; and then when the right eye is opened again, the optical illusion, said to be impossible, becomes apparent. This is an aim that will send the shot many feet away to the left of the intended mark.

Probably only accident or ill-health would make a man trained to align with his right eye do such a curious thing as that above described; but the case is quite different with untrained eyes. It is in fact a very frequent fault.

A cure for it was attempted some years ago by a Mr. Gilbert. This consisted of a sight extended down the rib so as to have no bead-like appearance to the left eye, but to resemble a line to that optic; whereas to the right eye it appeared like an ordinary sight. It was a good idea badly explained, and carried out clumsily. Later on Mr. Gilbert designed a guard that screwed on to the left barrel for the purpose of obstructing the sight of the game and the foresight from the left eye. This appears to us to have been exactly what was not wanted.

As we have already explained, the shooting from the left eye and shoulder is preferable to the partial loss of sight of the game you wish to kill, and if the latter, as well as the foresight is to be blocked out from the sight of the left eye, then the object of keeping the left eye open at all when shooting from the right shoulder is absolutely gone. The thumb stall, previously illustrated, or a modification

of the first Gilbert sight, having an ivory bead, the latter protected from the sight of the left eye by a black metal elongation on the left of the centre of the rib, are the two best methods of preventing the left eye occasionally doing injury to right alignment.

It is obvious that for a left alignment the reverse of these arrangements will prevent the right eye from unduly interfering.

There is, however, a very much more frequent cause of missing than this undue use of the wrong eye. We mean that accuracy of aim is well nigh impossible when both eyes are open, unless there is something at the breech end to indicate which is the exact middle of the rib. Flat ribs are excellent provided there is the indication we speak of, but it is usually absent. Moreover the breech of a gun comes so near to the eye that it is never as distinctly visible when the game is focussed as the foresight is. It makes a very great deal of difference, ten inches or a foot at forty yards, whether the sight has been taken due down the centre of the rib or from one corner of it. It used to be the practice of gunmakers to let into the false breech a strip of gold or silver showing the centre, but this seems to have gone out. The best position for any such indicator is not near the false breech, but where the back sight of a rifle is put. There it is much more in the focus, and much more apparent to eyes that are not and should not be searching for it.

We do not mean that any sort of rifle back-sight should be used, for the shape of the rib can always be made to indicate the middle, provided an absolutely flat rib, extended all the way to the false breech, is not insisted upon. We have sometimes, in the muzzle-loading days particularly, heard good shots profess a liking for guns without ribs, "so that you can look down a regular lane at them," said one of them; that was all right, but the external shape of guns was so different. Now they are so much wider in the false breech that with the eye low enough to align between barrels without a rib, there are some shots that would have to be taken with the game out of sight from

either eye. Thus, in making several feet or yards' distance for a bird going to the left, the right false line would block out the sight of the game from the eye, and the barrels would obstruct the sight of the target unless the head was thrown over to make the left eye higher than the right. Even then, if the bird were as well as quartering to the left, there would be a loss of the sight of it.

CHAPTER V.

SIGHTS AND RIBS TO GUNS.

THERE are many good shots at game who will tell you that they never see their sights, and could shoot just as well without them. On the other hand we find that when it is a question of shooting with a rifle at a slightly extended distance over those that a shot gun will accomplish, no refinement of sighting is too good for them. Even the telescopic sight or the Lyman back aperture sight is considered none too good. But there is a difficulty of getting on the object quickly with these two sights, and for this reason many quick rifle shots prefer the open or bar sight. We think, for precisely the same reason, that they are unconscious of seeing their sights with the shot-gun; that is to say, they have not time to find the aperture sight with the rifle, and they have not time for extreme accuracy with the shot-gun.

A fraction of a second of time saved with the shot-gun is equivalent to a gain of a degree of accuracy. But, provided there is no loss of time in gaining accuracy of aim and the use of the sight, there is and must always be a distinct gain.

Those who have not acquired this extreme quickness of accuracy probably rely upon a mechanical aim; that is to say, they bring the check on to the stock of the gun, nearly in the same place every time, so that a back sight or an alignment of the rib is not really necessary to fairly good shooting. To anyone who believes in the possibility of extreme accuracy with nothing more than mechanical alignment, we would suggest that they should attempt the use of a Lyman pin-hole aperture sight fixed on the handle of the gun in order to prove how very much the

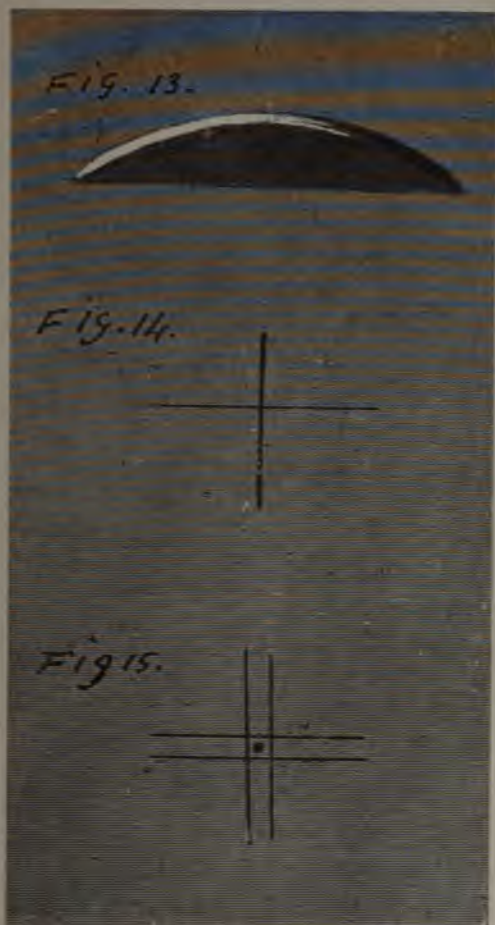
mechanical alignment will vary. If it could be relied upon the aperture would come exactly opposite the eye every time, and form no obstruction to quickly finding the object; but however well a stock may mechanically fit the cheek of the shooter he will never be able to use the Lyman pin-hole as quickly as he can the open sight.

No perfect back rifle sight for game shooting has ever been invented. Nothing that obstructs the view is good; nothing that makes it difficult to find the object is good. Every sight does one or the other, and most of them do both. The bearing that rifle sighting has upon the correct and quick alignment of shot-guns is not obvious at first sight, but it was only by investigating the defect of the former that those of the latter were brought home to our understanding. Perhaps it may be permissible to go through the process for the benefit of any shooters who have been too much engaged otherwise to do it for themselves.

We may possibly be told that it is all theoretical, and is never likely to improve anybody's shooting. We agree if they can kill 100 per cent. of their shots that investigation would be loss of time. If, however, like ourselves, the reader sometimes misses, and does not know why, we would suggest that it is because he did not know precisely where his gun was pointing, and in all probability, that was more the fault of the gun than it was the fault of the shooter.

We ask anybody who has heard of the double image in shooting (caused by two obstructions to the sight, one to either eye), to travel a bit further in this direction and to discover that the much-maligned man who sees double is very near home (no offence intended), and that he can not only see double with two eyes, but also with one. We believe that what is understood as focus is generally understood to be directing the angles of both eyes to the same spot. But focus is something much more than this. It much more resembles the expanding and contracting diaphragm of a lens. If the point of a pencil is held upwards about three inches from the eyes, and placed in

a direct line between it and an object in the distance, the point will assume different proportions according to whether the focus of the single eye is fixed upon it or the object aimed at. If the focus is alternately fixed first on one and then on the other, the pencil point will have the appearance of automatically enlarging and contracting. In fact, at the smaller



end it presents no obstruction to the eye, which *apparently* looks through it, in fact, looks round it from every direction; just as if a finger is placed upon a lens during the act of photography, the only result is to take away some of the light and not to blot out any of the picture, so does the

pencil point behave to the eye. It is obvious then that a good view of an object may be obtained from any part of the surface of the pupil of the eye. So that when we place our eye opposite the Lyman pin-hole it does not follow we have the centre of the eye opposite, even if we see the object well. A better proof of this is perhaps the following: If silk textile is placed over one eye, and a small object in the distance seen through it is focussed, it will be found that it is apparently multiplied. There appear more than one of the focussed objects. A good thing to look at is the top of an air shaft against the clear sky. The meshes of the silk multiply the object. It is not that the silk itself is transparent and refracts the light, for the same result will be apparent if wire mesh is used.

It almost appears as if the exact centre of the eye is not used at all in sight, for when wires are crossed like Fig. 14, and held so that the cross covers an object in the distance, the cross being about two inches from the eye, what appears to be visible (the focus being on the object represented here as a dot, and *not* on the wire) resembles Fig. 15. The only cure for this is the telescope sight. How much appearances deceive is well shown in using these sights; thus an object perfectly visible to the left naked eye is instantly lost to it, in spite of no intervening obstruction, the moment that the enlarged object through the telescope is caught by the right eye.

The disadvantage of the Lyman pin-hole is not only that it is difficult to find, but that when it is found it obstructs the light. That is to say, only a part of the light from the object aimed at reaches the eye at all. This fact can be best tested by making a small aperture between the thumb and finger; when an object has been found through it, then a sudden enlargement of the aperture looked through will show how much light has been prevented from reaching the eye through the small opening.

Different eyes see variously distant objects in alignment at the same time, and with the same focus, with more or less distinctness. Generally it will be found that an open back-sight cannot be distinctly made out, placed where it

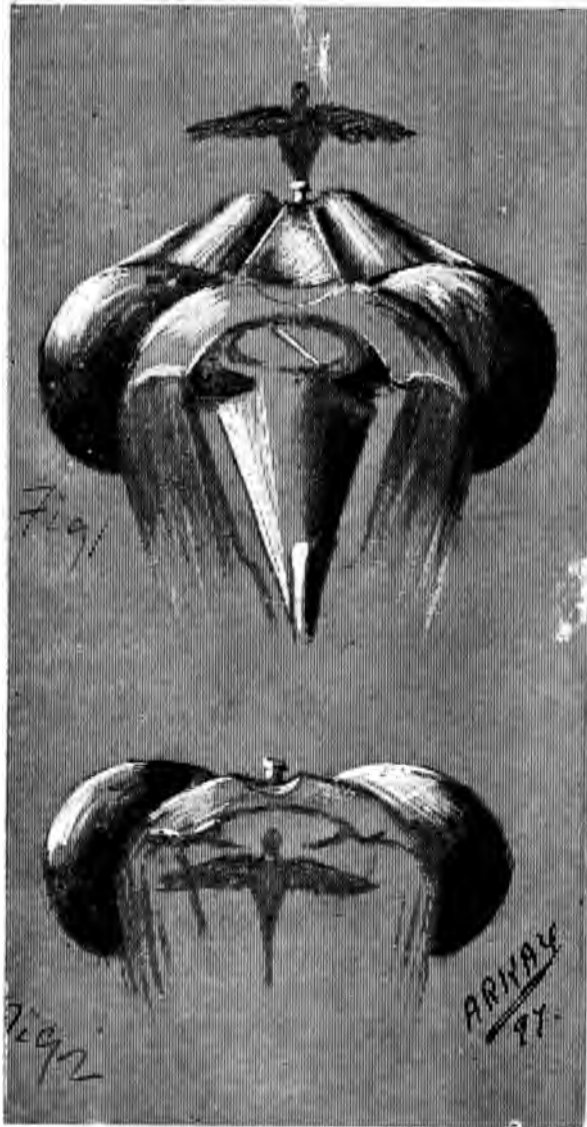
usually is upon a rifle, when the focus is upon an object 100 yards away. The foresight will however be distinctly and clearly outlined. Herein lies all the trouble about open and bar sights. An aperture-sight is placed much nearer to the eye, but with the pin-hole no attempt is made to determine where the exact edge is. What the eye sees with the Lyman sight is an undefined ring with most light in the middle of it. It is only by treating the V sight in the same way, that is, by ignoring its apparently multiplied lines, that the best use can be made of it. The best target shots—Mr. E. Rigby, one of them—tell us that these multiplied lines appear to them too.

What the eye sees in aiming a shot-gun is a confused mass of false breech, in which the breech end of the rib is sometimes indicated, and sometimes is not. For the false breech is much nearer the eye than the open back-sight of a rifle, and consequently much more out of focus of the eye that sees only the foresight and the object of aim distinctly. Yet, unless the eye is in the exact centre of the rib when it places the bead upon the object of aim, it is worse than useless to use the bead at all. Without doing so you may aim straight; by doing so you cannot, unless the eye, as we have said, is exactly opposite the centre of the rib. It can hardly be wondered at then that a good many people have learnt to shoot without consciously using their foresight.

The fault is not in the foresight but in the position of the indicators of the centre of the rib. These are never in the right place for quick and easy use to be made of them in a shot-gun. At the false breech everything is indistinct when the game is focussed; and, although the eye can focus the false breech and see whether it is right, yet this change of focus takes time, and the consequence is it is impracticable; any attempt to do it would lead to slowness and misses.

To be able to align, then, correctly it is necessary to have the indication of the centre of the rib nearer to the foresight. We believe most shooters accomplish it by making use of the rib nearer to the foresight, but this involves

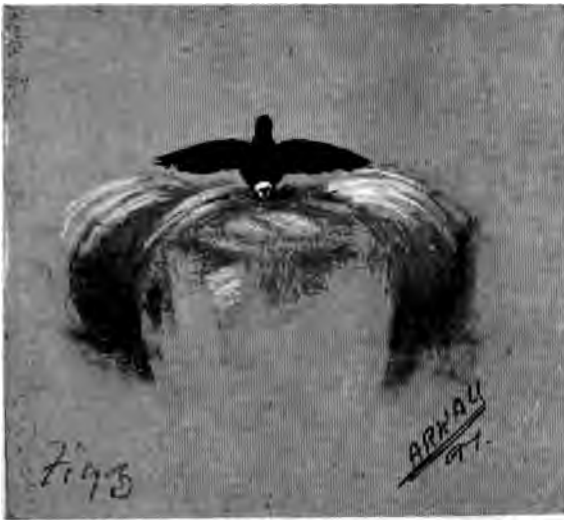
looking over the gun and not true alignment. This probably one of the causes for the fashion for strai stocks, for when the eye is well down, for true alignme



the rib cannot be seen ; as there is no other indicator the true centre for the eye, shooters have had to make best of imperfect tools, and have not therefore got do

their eyes for true alignment : or their guns up to their eyes, which is the American equivalent.

The usual kind of rib is one that is sunk in half-way between the breech and the muzzle. The appearance of this to the aligning eye is not one that conduces to extreme accuracy. It is true that it helps a little to get the sight over its centre. Some years ago Mr. Stephen Grant, in condemning short barrels, said, "If you are out with a long barrel, you are more out with a short barrel." We apply that remark here, and say if you are out with a rib that you can see from end to end, you are more out with



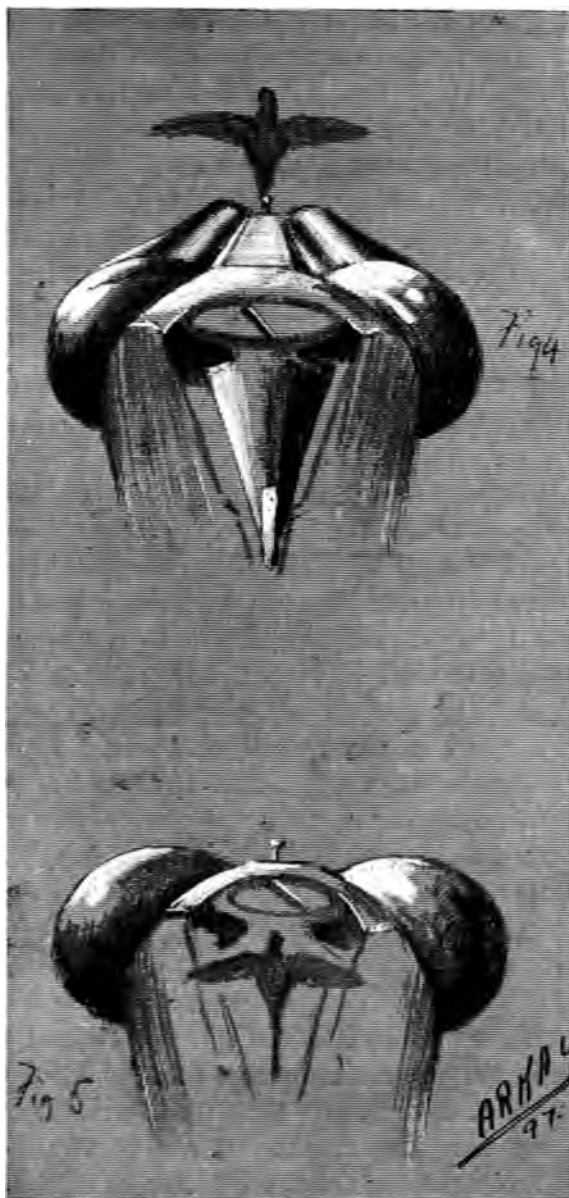
a sunk rib, one that you can only see ten inches of near the muzzle. The flat rib is theoretically better, but in practice it is not better, except to one who has learnt pigeon-shooting methods, and looks over his straight-stocked gun, instead of getting down to alignment.

We are quite certain that there are thousands of shooters whose methods would allow of extreme accuracy coupled with quickness provided that guns were made on lines that permitted exactness of alignment. We cannot think of a better proof of the marriage of accuracy and quickness than Lord Cairns' performances at the running

deer at Bisley. Using an open V sight he certainly got his two shots in while the deer was travelling about five yards, and yet at the 110 yards he scored bullseyes for at least half his shots, and an outer was almost an unknown quantity. Lieutenant Rankin using a Rigby double with the Lyman sight made nearly as good shooting (in July, 1897), but in nothing like as good time. The average of Lord Cairns' shots at the running deer would not have been one inch out at 40 yards' distance. Similar accuracy with the shot-gun would have caused results to depend entirely upon a judgment of speed for driven game. Judging by shooters' performances at pigeons from the traps, and at clay birds, there are a very great many who are not accurate in this extreme sense of the word, even when there is very little or no "allowance" to be made.

We have already dealt with the extraordinary power that the left eye has of placing the bead in direct alignment between a point in front of the game and the right eye when the vision of the latter is obstructed by the gun itself. It was then shown that apparently the game was seen through the gun itself by the right eye, although, in fact, the right eye was doing no more than align the rib and the foresight, and the left was doing the rest. Figs. 1, 2 and 3 represent the same gun, a gun with a hollowed-out rib, and Fig. 1 represents what we have called the pigeon-shooters' method of making "allowance" for his coming game: that is to say, he looks over his rib, and, although Fig. 1 does not truly represent what he does see, it represents what there is to see when the gun is at the shoulder. Fig. 2 represents the same gun aligned to a point ahead of the coming pheasant, with the bird apparently seen through the gun, but really seen only by the left eye; and the distance between the bead and the head of the bird is measured by the left eye. But although we can see the bird and the foresight as plainly as they are visible here the false breech cannot be taken in and defined with the same focus anything like as clearly as it is here. What we really see of it is represented to some extent in Fig. 3. Our artist complains that it is a difficult thing to draw the gun

when the eyes are only to be focussed upon the bird. We think he has made the false breech a great deal clearer than he ever



saw it under those circumstances ; but as it probably appears differently to long and short sighted people, we let it pass.

Nos. 4 and 5 represent similar aims with a flat rib, and show what there *actually is*, certainly not what is *seen* at the false breech. There is very little to choose between these two formations of rib and false breech; there is something to guide the eye to the alignment of the centre of the rib, but very little when the undefined outlines are brought about by focussing the game.

But if these are bad, Figs. 6 and 7, which represent a very common type, are very much worse. Here a flat rib is made perfectly even with a false breech, and although in such a wide expanse it is easy to find the middle, yet when the eye is focussing there is absolutely nothing except the mechanical pressure of the cheek against the stock to bring the eye into centre alignment of the rib; for when the eyes are focussing the game, the outlines of the false breech become hazy and indistinct.

We have a gun that has no rib whatever, and we have tried some experiments with this weapon that may serve the purpose of illustration as well as of suggestion. Between the two barrels we have inserted a metal, Fig. 13, at a spot intermediate between the muzzle and the breech. This acts as a rib, although it is only two inches long, and is curved. By this means we have all the value of a rib, but one that is always in focus, and the actual appearance of it to the eye when shooting is indicated in Fig. 12. That is to say, the outlines are always distinct; for when truly aligned it is not hidden by the false breech in the way every other kind of rib is hidden. Its shape is indicated in Fig. 10 and Fig. 11.

We will not say whether we have done better than our average work in the field with this rib, but we can honestly say that when plating a gun we can make certain of accuracy in very much less time than when without it.

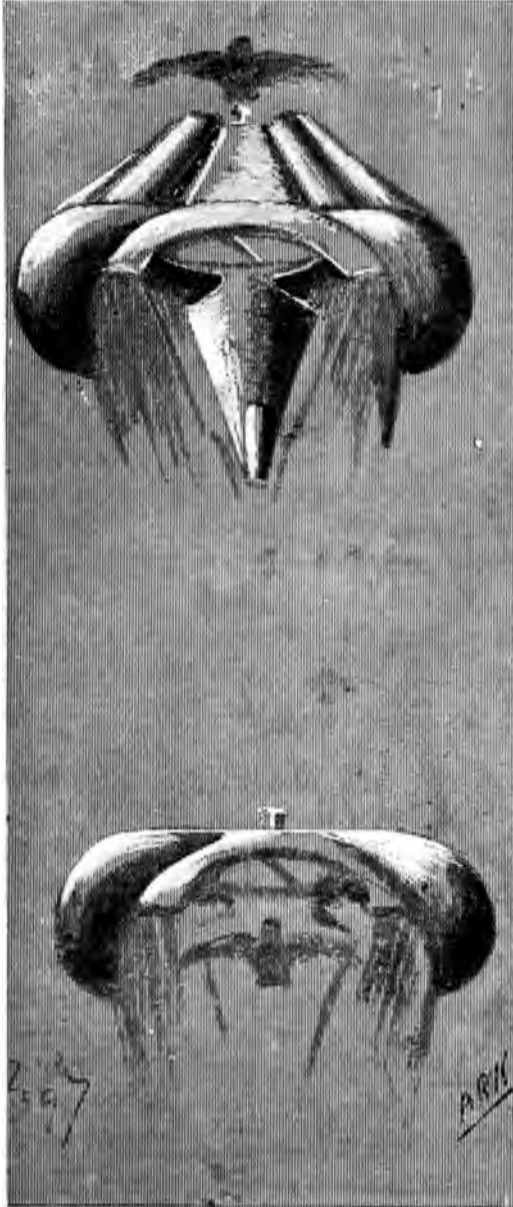
We are, of course, aware that most shooters, and good shots too, say that they make no use either of their gun rib or the foresight. That they never wilfully look at either we grant, but that they make no use of them we believe to be a total mistake. The rib is an all-important factor, and that it is so is proved by the position of the

head of nearly all good shots when shooting. We do not say that any rib or any sight is absolutely necessary for the attainment of a certain degree of accuracy; such, for instance, as that degree required for slaying rabbits hopping across a ride at fifteen to twenty-five yards' distance, a sort of shooting that some men—the late Sir Victor Brook for one—could do well without bringing the gun to the shoulder at all. Shooting from the hip at rabbits is one thing, but we never heard of success in that method of shooting at feathered game, and there is no doubt that, as the object of aim grows quick, distant, and difficult, a greater and greater degree of accuracy is required by the gunner.

There is a superstition that as the distance increases and the charge spreads the less accuracy is required. In our view this is wrong. The killing circle of shot increases in size up to a certain distance, no doubt, but after that it diminishes very quickly. The shot pellets, for instance, that were within a few inches of the circumference line of a thirty-inch circle at forty yards are at fifty yards no longer close enough together to form a part of a killing circle; at that distance they have become only stragglers. Whereas the centre of the killing circle at forty yards alone forms a killing circle at fifty yards.

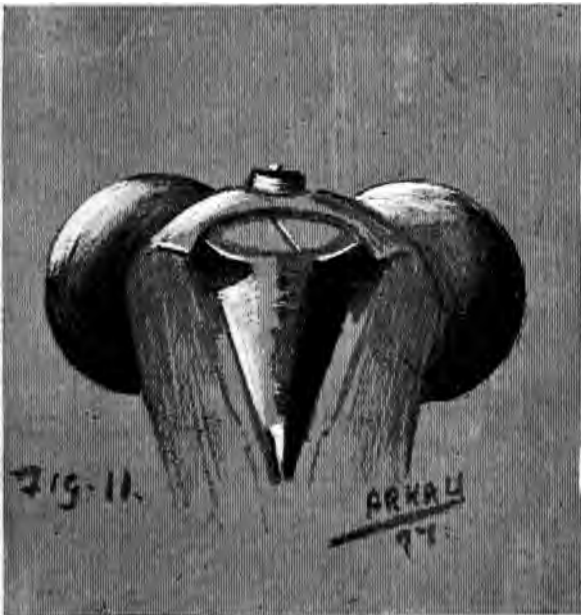
But this is only one side to the question, and a minor one. The further the game is away the greater is the number of feet or inches that the same angle of inaccuracy of aim measures; thus, ten inches at twenty yards, becomes twenty inches at forty, and thirty inches at sixty yards; and such an inaccuracy requires a pattern of sixty inches diameter to hit the game, and a bigger one to kill it. There is many a good 12-bore that will give a twenty-inch killing spread at twenty yards, and so would meet the bad aim, and counteract it at that distance; but there is no 12-bore, however loaded, that will give a sixty-inch killing circle at sixty yards, yet there are many that will make a killing pattern in the centre of the target at that distance, but it is always smaller, not larger, than the certain killing pattern of the same gun at forty yards.

We all know at what extraordinary distances a great shot will kill his game time after time. Does ar



conceive it could be done by relying upon the outside p
to make up for want of accuracy? We doubt wh

anyone would advance such a theory. Possibly the most remarkable measured feat with the shot-gun ever recorded was that which Lord Walsingham was so kind as to send to us in 1887. The performance was two rights and lefts at wild duck in full feather: the measured distances were all over eighty yards and ran up to 112 yards. Great good luck, no doubt, especially with a cylinder gun and No. 5 shot. Yes, but such good luck that never could occur to anyone who made no use of his foresight and rib; luck



that could only accompany absolute accuracy of aim, as true as Lord Cairns shoots at the running deer at Bisley. He almost invariably makes bullseyes and inners. Does anyone suppose that he could do it without sights? If not, why does anyone suppose accuracy with the shot-gun could be attained with neither foresight nor rib? That those who shoot accurately use both, although they are mostly unconscious of doing so, we are convinced. Few, indeed, deny that they make some use of their foresights, but many believe the rib to be a useless piece of iron.

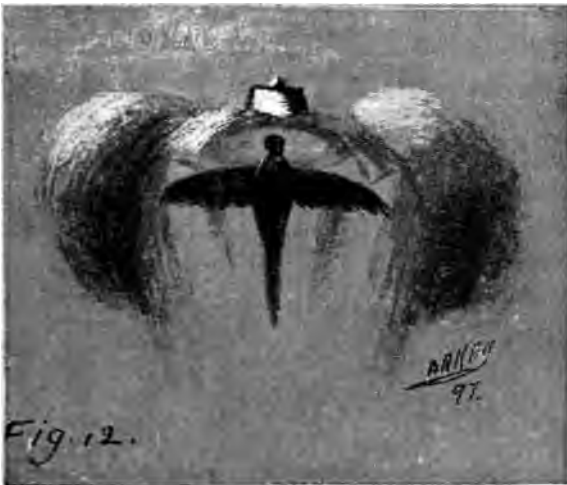
All shooters lower the head somewhat to the gun, and there would be no possible object whatever in this were



Fig. 8 is side view of 1, 2, and 3. Fig. 9 is side view of 4, 5, 6, and 7. Fig. 10 is side view of 11 and 12.

it not to enable them to use the alignment of rib and sight more or less.

It always appears to us that the more nearly accurate alignment is obtained—that is, the more the eye is brought into true alignment with the rib and the sight, the more accurate the shooter becomes. It takes no longer to obtain a true, than it does to get a partial sighting; that is, not with a gun that fits; if it did there would be more to be said for the billiard-player's principle of sighting so often quoted as the grand ideal. But then if we could not shoot at game a precious deal straighter than the majority can play at the ball the length of a billiard table away, we should not kill much game, and anyone who took the time



for aiming that is taken in billiards would kill none. The fact that a cricketer can put out his hand a yard, and meet a cricket ball, has been made to father the absurd idea that if his arm was forty or fifty yards long, with only the same strength, he could exercise an equal control over it, and could stretch out his hand and catch his snipe or his driven grouse. The gun and the game do not permit of the same successful inaccuracy as the cricket ball and the hand do. An inch from centre at a yard distant becomes forty inches from centre at forty yards. We all can miss, and it is not all of it erroneous calculation of the speed of our game that causes us to do so. That is an error of judgment

that we must make upon occasion, and there seems no reason why we should add to our error by aiming inaccurately, however little. A little to the right or left and a little high or low make a good deal when they are added together. It has become much more necessary to aim absolutely straight for the spot our judgment directs than it was before driving became the fashion; and we are convinced that there are many like ourselves who feel that the position of the rib at the false breech is not enough indicated to the eye in any guns. We do not see how it can be as long as the indication is so near the eye, and therefore so much out of focus.

It should not be, as it is, so very much easier to aim *accurately* with an open V sight and a rifle than it is with a shot-gun. That it is so anybody can tell for himself by trying to use a ball and shot gun accurately without a back sight, and then using the same gun with a back sight, both at a moving target.

The rib is in such a position that it does not help the shooter to know where he is shooting, although it does help him to get his degree of accuracy. That is to say, the rib is out of sight at the moment of pulling trigger, although it was in sight the instant before. It is a great assistance provided everything goes right, and alignment and "allowance" are obtained at the same instant of time; but if the allowance has to be made or corrected after alignment of the gun is effected, the rib ceases to be of use: then the false breech (confused by want of focus) and the foresight alone remain to help the shooter to an absolutely accurate sighting. In practice this is often felt at driven game, in which swing or jerk is frequently very much relied on, instead of eye-measured distance.

CHAPTER VI.

STYLE.

THERE are several causes of bad shooting and many more ~~than~~ several ideas of the manner of treating them. It is ~~hardly~~ likely that experts can agree about the latter when ~~they~~ are not agreed upon what good shooting or good style in shooting really is. There are at least three distinct schools, each teaching or believing in different methods. ~~The~~ first and oldest of these is

(a) The advocates of aligning from false breech to foresight.

(b) The second is the pigeon shooter's manner, that is, ~~aligning~~ the foresight on the game with the eye well above ~~but~~ exactly over the centre of the false breech.

(c) The third method is that of looking at the game and ~~throwing~~ up the gun, in confidence that the hand and eye will work together.

Whenever an argument occurs about shooting it will nearly always be found that agreement is impossible, and that the longer the argument proceeds the wider the disputants get apart. The reason of this is that the advocates belong to different schools, *a*, *b*, or *c*.

These classes can again be sub-divided. There is in each of them—

(1) The shooter who calculates distance and elevation, and brings his gun to bear upon an imaginary spot in front or above his game, as the case may require, by focussing the game, or the imaginary spot, and detecting how much to right, left, above, or below his gun muzzle is, and directing it accordingly.

(2) The shooter who brings his gun to bear on the game and then jerks it into the required allowance, pulling as he jerks.

(3) We are inclined to believe there is a third sub-division who knowingly never "allow" at all, and the reason they do not invariably shoot behind their game is that the gun comes up with the muzzle pointed to the direction where the game first became visible, and that in order to get on it there has been a race of the muzzle after the game, the trigger being pulled only when the gun has overtaken the game; the shot does not leave the muzzle until momentum, set up in the race from behind to the front, has carried the latter past the point intended. It is absolutely impossible that there can be a sudden stop of the muzzle, as the muscles cannot effect it even if the will demanded it. As 1, 2, and 3 can each be applied to *a*, *b*, and *c*, there are at least nine chances to one that the best shooting conversation will be misunderstood by the listener.

The most frequent incomprehensible remarks will come from *c*, the shooter who believes that he looks at his game and shoots without alignment, but simply, as he will tell you, in the way you catch a cricket ball, shoot an arrow, or use a fork in feeding yourself. This is a style of shooting that is more heard of than practised; its correct name is snap shooting, and we have noticed that many of those who think they practise it are considerably longer in getting off their guns than some others who confess to the older fashions. Besides, their practice not going to confirm their precepts, the illustrations they choose are not convincing. There is the cricket ball, for instance, which, when it is caught at a yard distance from the eye, covers as much of the horizon as a ten-foot sphere would at forty yards. Perhaps even a poor poking aligner might hit a ten-foot sphere at forty yards, so that this argument proves nothing. It is best not to apply the same parallel to the argument of the mouth and the fork, as the fork is so much nearer, to begin with, that comparatively the mouth would grow out of all recognition at forty yards. This has been best answered by one who solemnly assures those who place reliance on it that he can use his fork in the dark, but that no one can use a gun with equal precision in the dark, no matter what system he adopts. That disposes of No. 2 argument,

and then there is only the bow and arrow left. Mr. Ford revolutionised this sport when he first adopted the plan of drawing the arrow directly beneath the right eye, that is, below the chin instead of to the right ear, as had been customary until his time. The scores at once mounted up with this alteration of method, but it appears that those who advocate the principles of archery at stationary objects, as applicable to the shot-gun and moving objects, can best be answered by the practice of riflemen at stationary objects and their constant struggle to obtain sights giving improved definition.

But possibly the best answer of all to the *c* school is their own precept. They tell you to look at the object and put up the gun, and that the latter will then assuredly cover the former. In that case, if they are correct, a miss will almost always result; the game is not standing still. If you say this, the proposition is very likely to be modified, and you are then to gaze at a fixed imaginary spot in space. This is a simple impossibility, for when there is nothing to guide the eye it wanders while apparently being stationary all the time. It is easy to fix a spot in front or behind the game if there is any sort of background, but it is not easy, or even possible, when gazing into the vault of the sky. If this is brought home to the shooter, he will probably say that the game fixes the imaginary movable spot by its proximity. But if this is the case, then it becomes difficult to say whether the shooter is not focussing the game one instant and the imaginary spot the next; and it is also difficult to detect how much this rapid alternation of focus influences the direction of the gun, for be it remembered that the *c* party declare that you are not to see your gun.

It is not difficult to kill rabbits crossing a ride in this style: they have been killed when shooting from the hip; but when the distance to be allowed is yards in front, as for a grouse down wind, better work can be done by those who are able to make the utmost use of the pointer they hold in their hands. It is very easy to detect the approximate distance by which one bird leads another as they pass the

spectator, just as it is easy for a judge to tell the number of lengths by which a horse race is won. It is simplicity itself to detect the fact when one moving object overtakes and passes another, and the shooter who makes the muzzle or sight of his gun equivalent to the leading bird, overtaking and passing the game he is shooting at, seems to have a better means to accuracy of allowance than he who never sees his gun when he shoots. Of course it is possible for a man who keeps his focus on his game and never is conscious of seeing his gun to jerk it in the direction the game is going after presenting it; but then this is never done by snap shooters, and if it were done it would cease to be snap shooting, and would be a longer operation than his who shoots as described under *a* and 1 or *b* and 1, neither of which are necessarily two operations, although they may be made so. The jerking of the gun forward after presenting at the game must necessarily take two operations whether the shooter belongs to the *a*, *b*, or *c* classes, and although an excellent practice to learn or to fall back upon when a shooter is more or less out of form, it does not constitute the finest form, and we have known game come much too quick to give it a chance; moreover it sometimes happens that in crossing over rides, pheasants are not visible long enough to put it in practice. In such cases one swing of the gun from the ready and a simultaneous press of the trigger are all that is possible in the time, and yet the shooter whose method is *a* and 1, or *a* number 1, is well aware how much ahead or behind he was when he fired.

We have never yet seen a shooter of the *c* class who was able to shoot a choke-bore charge into the centre of a target at forty yards without adopting a, to him, new style of putting down his head and aligning, so that we doubt whether those who "never see their guns" really know exactly what they do in the presence of game.

Between *a* and *b* there is a great difference; *a* gets his head down to his gun or his gun up to his face according to bend, whereas *b* looks over his gun at the game, pointing with the sight and looking over the rib; by this means *b* is enabled to aim at the rising bird when the shot should go

well over that which he is focussing. This is an advantage in quickness, for it is unquestionable that it is quicker to aim at an object focussed than a certain distance over it. It is for this reason that pigeon guns are usually made straight in the stock. A pigeon from the traps is rising almost always, but when it comes to high quartering game the elevation given by the height of the eye above the rib may be all wrong, and then the method of exact alignment described under *a* has the advantage. Besides this a twist of the gun half over, so as to have one barrel higher than the other, acts in two different ways, according as a man shoots by alignment of breech and foresight and game, or by alignment of game and foresight only. The former keeping true alignment with a tilted gun shoots in front and low; the latter when he places his foresight on the game and tilts the right hand barrel up (a very common habit when game is coming from the front and passes on the left), shoots high and to the right—that is, behind. If the left barrel is up, and game is passing from the same direction to the right, then the shooter shoots high and to the left, that is, behind again.

Here is one very common fault which is brought about by the small degree of “following on” necessary to catch up the game, and because instead of turning the body from the hips a twist of the shoulders is much easier. Nevertheless here is a fault commonly supposed, like the rest, to be curable by fitting with the try-gun. It is obvious, nevertheless, that the cast-off that might help for the right hand shots would make matters worse on the left.

When we consider what a variety of manners of shooting there are, it is hardly to be wondered at that the try-gun should be considered a short and easy road to discover what a shooter does, and as a true diagnosis is half way towards a cure it may be recommended so far. To find out what a man does with the gun, and to discover why he does it, are two very different propositions. As we have said, the methods of shooting adopted by good shots are at least nine. Each fault may, and probably does, have some different effect, according to which of these manners is adopted; and

faults in shooting are numbered by hundreds—optical, physical, and nervous. Yet people expect that their own experience is quite certain to be of use to others, and think those who cannot make use of it wanting in intelligence at least. It is obvious why Mr. H. Greener thinks there is nothing like the principle of shooting adopted in archery. Anyone who had for a customer a crack pigeon shot who could use any stock, bend, or cast-off equally well would think so. Mr. Boswell, it is natural to believe, does not advocate much cast-off or bend; pigeon shooting has formed his judgment, and the foresight aimers (*b*) form no small proportion of his customers.

A cure effected by a variation of the shape of the stock, as suggested by the try-gun, can hardly fail to be one in danger of being counteracted as the novelty of the stock wears off and becomes, as it were, part of the shooter. This certainly is so for every fault except those which arise from optical defects.

There is no doubt, however, that too much has been claimed for the try-gun, which is a most useful servant but a very bad master. To illustrate this Mr. H. Harriss told an excellent story of a man who had been fitted with a try-gun. When the weapon was ready he found it to be enormously cast off, and complained that it did not fit him. "Oh," said the gunmaker, "it is quite right; your left is the master eye." That was strange, to say the least, as his left eye was a glass one. We cannot go as far as that in appreciation of the try-gun, but we have lately discovered that it is not necessary for one eye to be the stronger for it to become what is called the "master eye," that is, the aligning eye.

As previously explained, it is not necessary, when shooting from the right shoulder and aligning the sight with the right eye, for that eye to see the game at all; if the left can see the target and not the sights, and the right the sights and not the target, that suffices, and the right eye may still be master and the left only its servant to bring the aligned sights upon the target. We have lately had **personal** illustration of this, as in some lights we cannot **distin** . . . small bullseye at 100 yards with the right eye

both eyes open we can make very good practice ; and to establish the fact we can do equally well with a sheet of paper placed at the muzzle so that the right eye can see neither bullseye nor target. We believe that everyone who tries this will do it at the first attempt, and yet we have discovered a good many expert rifle shots, and gunmakers, who had no idea that this was possible. The master eye is master to this extent. We do not know whether when shooting from the left shoulder with everything reversed it is as easy.

CHAPTER VII.

STYLE. -- (*Continued.*)

IN the last chapter we attempted to divide good shots into three classes, each adopting a different principle in aiming : *a*, *b*, and *c*; and we also attempted to subdivide each of these by 1, 2, and 3, each representing a different method adopted to get in front of moving game. We are very well aware that there are shooters so amply gifted that they can shoot in any of these methods, and perhaps, also, any of the subdivisions of them. They, of course, would regard as foolish any attempt to indicate which method was the best, and those experts of shooting schools who insist on any one style of shooting would by them be considered in the elementary stage of learning. One of these latter will tell you that *a* is the correct system, and another will assure you that *c* is the only method of shooting well, and that the less you use your eyes to see where your gun is pointing the better you will shoot. We are well aware that the most brilliant form is that which is accomplished with apparently the least effort; at the same time, we have observed that those who know of no other method of shooting than *c* (the hand and eye working together) become useless shots the moment they are out of sorts, and go from bad to worse.

The first beginning of most shooters is the rifle-like aiming style. It seems to us to be the best style to begin with, because practice quickens it up to the speed of snap shooting, and the dividing line between the two is lost by the expert shot. It might be asked, "Why begin by aligning if the snap shot is the ultimate goal?" We should answer that there is all the difference in the world between the snap shot who can see where he is pointing and the snap shot

who cannot. That is not all the advantage of a method growing out of the aiming style. The latter does not prevent a man being able to snap off as quickly as one who never aimed, but it has this advantage : when the shooter is a bit off colour he can return as the case requires more or less to his aiming, and by that means recover first his confidence and then his form. The born snap shot cannot do that. If he is in form he is brilliant ; if he is off colour, on the contrary, he is nowhere, and perhaps makes excuses, proving thereby that he is altogether demoralised.

We know one excellent shot who was for some time engaged to teach at a shooting school ; he practised the *c* style of shooting, and believed that no other was any use. Certainly, he could shoot the straight away shot with anybody ; but the time came, as we predicted it would, when from the first rank of this kind of shooting he sank to the third. No doubt he had some successes in teaching shooting, but it is impossible to expect the pupil to excel the master ; consequently those he did succeed in improving might at any time fall away again, like himself, and then they would also, like him, know of no means to recover their form. No man can really be said to be first class who cannot shoot slow or quick, as the case requires. Often the man who can snap, and nothing else, is out of it. A rabbit or pheasant across a ride within fifteen yards of him he will either let go or plaster. He cannot measure an exact ten or twenty inches in front of its head, and so touch it nowhere but in the head. The man who has learnt the rifle-like style can do so at such distances.

We have no belief in this feat at tall birds or long distances, for, as previously explained, only the slowest of the pellets strike the object when the aim is too much in front. At fifteen or twenty yards that does not matter, but at long distances it does. No doubt high birds are frequently killed by head and neck shots only, but this does not prove that the bird did not receive the centre of the charge. It is much more likely when this does happen that ^{the} shot have glanced off, as they are very liable to do, feathers.

There is a defect in shooting for which Mr. Gilbert invented a shooting corrector. That is an alignment of the foresight of the gun and the objective with the left eye, when it ought to be done with the right eye.

Y

X

C D E F G H I

A

B

Speaking broadly, Mr. Gilbert assumed that as long as the foresight was visible to the left eye of a right-shouldered shooter, that eye would more or less influence the aim. In the above diagram, let A B represent the two eyes. X the game, then with the butt of the gun precisely under B (the right eye), the left could assume command of the foresight, and drag it over as far as C, so as to be in absolute alignment between the left eye and the game, while the butt rested on the right shoulder, and the muzzle, therefore, pointed at Y, instead of X. On paper it looks impossible, but in practice it is quite possible, and the sooner a shooter who would do this often gave up attempting to align with both eyes open, in a rifle-like method, the better for him. But it is found in practice that when alignment is given up, and the hand and eye are left to work together, the left eye still asserts itself in some individuals, with the result that the muzzle is dragged over, not to C, but to D, E, F, G, or H. To effect a cure, an elevated thumbstall for the left hand is all that is required, although it is more fashionable to find the constant angle of fault by the use of the try-gun, and have a new pair of guns built to its indicative cast-off. Cast-off was primarily intended to fit the shoulder and the

cheek, and not to correct faulty eyes. It is in its extreme sense necessary for a man who is blind of the right eye, but for any preponderance of aligning habit of the left eye, by far the best cure is the thumbstall that hides the foresight from the left eye, but does not hide the game from either.

This question had been thrashed out in the shooting lodges long before Mr. Gilbert was heard of; but as the younger generation probably did not see anything of it in the papers fourteen years ago, we will quote letters that appeared in *Land and Water* about that time, for even as late as last year we saw arguments and even expressions used in the *Field*, as original, which will be found in this correspondence fourteen years before. This is not the only reason we quote; we do so because we are convinced that the letters of that time in *Land and Water* form by far the best shooting correspondence that has ever appeared on the subject of aiming, holding forward, swing, jerk, and the rest.

We will begin with a short extract from Mr. Gilbert, of shooting corrector notoriety :—

“You state that your experience is that right-eyed shooters do not require anything in the nature of a corrector. My experience is the reverse, providing the weak left eye is capable of seeing the muzzle fairly well. I have arrived at this conclusion from testing the eyes of hundreds of sportsmen. It does not matter if this weak eye cannot see the bird; it is still liable to align the muzzle on a bird that is only seen by the strong right eye. I fear your readers will think I am talking riddles. It certainly sounds ridiculous, but it is nevertheless true. I may explain how anyone can prove it for himself at some future time; but my experience is that unless the left eye is too weak to see the muzzle it is often liable to direct the aim, unless prevented by a corrector.

* * * * *

“Whichever eye, be it a strong or a weak one, that first catches the muzzle nearest its line of sight to object (remember both eyes can never see the muzzle aligned at the same time, only one eye at a time can aim; I see some writers believe they affect some sort of aim with both eyes) is a signal for firing. A weak eye cannot refuse the aim when forced upon it by the lateral movements above described—~~hence the many~~ unaccountable misses by many first-rate shots. I actice or experience can achieve what hooter.”

As Mr. Gilbert says, it appears to be ridiculous and impossible that the left eye can align the foresight on to the game that it cannot see. So far, however, he was quite right. When he goes on to assert that both eyes cannot really align at the same time, he is also right; but what he did not appear to understand was that the owner of the eyes may be deceived into an appearance or mental impression of alignment, although the foresight is really between C and I in the diagram.

From the point of view of the shots I have called *c*—that is, the hand and eye working together shots—the following is an excellent letter, but it obviously comes from a shooter who was not troubled by a want of corrector to imperfect vision.

"I see that Mr. Gilbert is still pegging away at his theories and settling everything comfortably to his own satisfaction. He has already decided that poor Colonel Hawker 'is not a circumstance,' and that there cannot be, and never has been, any consistent shooting until he himself came on the scene. He remarks of the shooting of your humble servant, and those unfortunates who are afflicted in his peculiar way, 'I know their average.' Indeed! And yet he does not in the least know who I am. You know me, Mr. Editor; but, as for Mr. Gilbert, he not only professes to 'teach the young idea how to shoot,' but we see he aspires to rival Mr. Bishop, the eminent exponent of 'second sight' and the mysteries of thought reading. It is just possible that, if he really did know my average, as you know it, and as it was in the days before *morose canities* corroded my powers, it might prove rather a severe shock to his theories. However, let that pass, and so long as he is satisfied it is all right. The only thing that puzzles me is how those who hold his views can manage to put up with the concert of hand and eye (or, as they contemptuously term it, 'rule-of-thumb') in the ordinary customary acts of life, and how they can direct their course in the streets without a pair of blinkers, or concentrate their wandering vision, or how they ever manage when they take their meals to put the fork into their mouths instead of into that of someone else, since they cannot by any possibility adopt the plan of aligning, but must leave it to nature. Bad workmen, we know, have ever found fault with their tools, and whilst a bad workman spends his time tinkering with his tools his fellows are working with theirs.

"Mr. Gilbert and his friends cannot shoot unless their guns are incrustated with a *chevaux de frise* of dodges of all sorts; whilst a

good keeper can take any gun you choose to put into his hand and shoot well with it. Fancy has a deal to answer for in most things, and no man ever shot by reading books and newspaper articles, or hearing lectures, no matter how plausible. A good shot *nascitur non fit*, and if a lad has got the making of a shot in him send him to the best tutor to learn, *i.e.*, work in the field. If he cannot then shoot, he is only another instance to prove that all that glitters is not gold.

"Some of Mr. Gilbert's champions point to the fact of his assertion that a certain number of good shots agree with his statement that no one can shoot unless he aligns. It is impossible to know who these 'good shots' are, and how far they were conscious whether they did align or no; indeed, if I am not mistaken, Mr. Gilbert admits that in some cases there was a little hesitating on this point. But granting all that is alleged, it merely proves that some men can shoot well that way, whereas others can do so in another. Mr. Gilbert lays so much stress on this aligning that one is tempted to ask him, does he remember that we shoot game with a shot-gun, not a rifle? If admitting his suggestion (which I deny), that no man who shoots in what he calls 'rule-of-thumb' fashion, can aim as true to a point as one who aligns, wherefore are fowling-pieces made to scatter the shot over an area covering, in good guns, a diameter of forty inches at forty yards? To show what can be done by 'rule-of-thumb' shooting, I, who, according to him, am a rule-of-thumb shooter, and cannot aim, can take up a gun at any time, look at an object, without bringing up the gun, then shut my eyes, toss up my gun, fire, and hit the mark, still keeping my eyes shut. I can do that every time. Therefore, in order to do that with my eyes shut, the concert of my hand and eye, as well as my power of aiming when my eyes are open, must be good. Can Mr. Gilbert or his friends do better than that, with all their paraphernalia of sights, correctors, and what not? That I do not align is proved by my shooting, as I say, in the dark. The only thing I am conscious of is the object at which I am to shoot, and its exact locality as I saw it last, and as it is impressed on my brain. The fact is, there is a great deal more in the art of shooting than Mr. Gilbert is yet aware of. He has got hold of a certain notion which he rides to death, but it is quite on the cards that one day he will think differently. He ridicules the instances of aiming without aligning given by myself and some of your other correspondents—such as the aim of a billiard player, a fly fisherman, a wild man with an assegai, a boomerang, or an arrow—but they are very pertinent. They all show the accuracy of the concert of hand and eye, or what he calls rule-of-thumb. There are bad shots, I admit, who shoot in the style he condemns. Of course there are—indeed, some men never seem to have a notion of shooting in them, even if they shot a hundred years;

but this sort of thing is not confined to men who shoot by hand and eye. Those bad shots shoot, in fact, on no system at all. There are bad shots who shoot in the much-lauded aligning style; and the worst shot I ever knew always aimed a rifle-like aim on everything. It is the aim of the ploughboy drawing a bead on a wood-pigeon with the gun he is sent out to herd the crows with. It is the aim of the Cockney sportsman, and the schoolboy crawling after a blackbird in the snow during the Christmas holidays with the gardener's gun, which he has stolen from the tool house. But no one considers these models of shooting. There are men who are too nervous to shoot well; men also who habitually close their eyes when they pull the trigger, or rather, before doing so—men who have no idea of distances nor of pace. It is absurd to class with such as these the men who begin and all their lives shoot without aligning, but yet by regular system. One of your correspondents remarks that as there is so much writing about Mr. Gilbert, it 'shows that there is something in it.'

"What it shows is that a man gratuitously attacked a certain class of shooters, and did his best to ridicule their habits of shooting, flinging about various choice epithets in doing so. It is not to be wondered at that he complains now of having drawn on himself a nest of hornets. That is what is 'in it.' However, he will probably modify his strong opinions as time goes on. We have seen him already through two editions of foresights, which are now discarded in favour of the corrector, and the dawn of a later notion 'is rising in the shape of a big sight on the muzzle,' to be thrown, no doubt, in its turn into the limbo where rest the remains of its forgotten predecessors.

"All through his letters I have noticed the absence of any signs of the apprehension of what is the very keystone of successful game shooting, and his criticism of my remarks on 'pitching and firing' proves that then he had no knowledge of it. His missing the point has also been the cause of the misapprehension of the same subject by a correspondent who shows he has been led astray by the question he asks me, and which I will now reply to. Mr. Gilbert seems to have his whole attention so concentrated on his hobby, the cause of his invention of sights and correctors, as if the whole of shooting consisted in that, and all his remarks show that he has but one idea, viz., to align a gun true on the object. That would be all very well if he were writing merely for target shooters, or shooters at fixed objects: but he asserts that he writes for game shooters, and this fixed aligning has but a very little part to play in the shooting of wild birds and animals in rapid motion. What is of more importance than the whole of it is swing.

"If he had not been in such a hurry to jump to conclusions about Colonel Hawker's dicta of pitching and firing, I would have finished it for him. It is as follows: 'He will, by practice, learn *to keep his gun moving* before a crossing shot, full high for birds rising up, and flying straight away very low.' Colonel Hawker was a celebrated practical sportsman, and those who now, without sufficient reason, sneer at his maxims, reckon without their host: for in all that constitutes a successful sportsman he was, at least, as well posted as they are. Now I have answered your correspondent, who is puzzled by the advice to pitch and fire in one motion. Mr. Gilbert, having his head full of aligning, and a rifle-like aim, cannot grasp the idea of keeping the gun *always moving*. One of the most fertile causes of bad shooting is dropping the left hand as the right pulls the trigger, and the man who is holding on his gun to align a rifle-like aim is much more likely to do it than one who never puts up his gun till the moment of firing. He has no time to let his hand drop.

"All men, even the strongest and best shooters, are apt, if a little fatigued or out of sorts, to drop the hand; those who have learnt the art of keeping their gun down till the moment of firing are far less liable to this unpleasant feeling. The nerves which would be unable to endure long enough in a firm manner for true shooting if any lengthened aim is required, can brace themselves readily when the call on them is momentary. The true secret of good shooting is the swinging or pitching of the gun at the right moment. Many a man who can align his aim right enough at any object is a poor shot, because he has not the knack of swinging and firing his gun in one motion. Mr. Gilbert has tumbled into the pitfall which those words of mine, 'pitch and fire in one motion,' created for him. Having nothing but aligning in his head, he naturally thought they must mean pitching and firing in one motion *at* the object. I believe the only difference between good and bad shots is, that the one swing their guns or keep them moving, and the others shoot *at* their game. On days when game goes straight away, by an accident a bad shot may perform fairly, but when they are mostly crossing, or rising, or overhead shots, he is out of it. The days on which good shots do badly are those when, as they well know, they shoot too much in rifle-fashion at their game.

"A man will kill snap shots brilliantly and consistently (a thing Mr. Gilbert cannot understand), who has mastered the secret of thus pitching and firing in one motion. It is a difficult, if not well nigh impossible thing to describe how this is done, and it is done in different ways by different men. I know one good shot, who (to take the instance of a crossing shot) sweeps his gun rapidly across the bird from tail to head, and fires when he has got beyond it. I myself race the bird as it

were, in my mind, without bringing up the gun; I then swing it and fire. This sweep or pitch is all done in one motion, and the gun is not stopped even after the trigger is pulled. To be a good judge of distances, calculator of pace, not to drop the hand, and to swing or pitch the gun and fire in one movement, is the pith of good game shooting.

“SENEX.”

Now, excellent as this letter is in almost every way, we see one or two possible sources of error in it to those who would follow its teaching. First, as to looking at an object, then shutting the eyes, and throwing up the gun, and hitting it every time. It is to be accepted as a fact, no doubt; but it will hardly ever happen that the centre of the object will be hit by the centre of the charge. Accuracy of aim is so much more essential in these days of driving game than it once was, that we are obliged to doubt the value of an argument based on the possibility of hitting an object with some outside pellets with the eyes shut.

Then there are occasions on which the best of shots miss unaccountably. Captain Horatio Ross told the following story of himself and George Osbaldeston:—

“During one of my visits to Ebberston (Osbaldeston’s Yorkshire seat), we were shooting the covert of Hutton Bushel, ‘the squire’s’ best beat for pheasants. A particularly gentleman-like man (a stranger to everyone out) joined us, and addressing ‘the squire,’ said that he had heard that the two greatest shots in England were present, and that he had come some distance in the hope of being allowed to walk a short time with us and see the cracks shoot.

“‘The squire’ was most civil, and begged he would take a spare gun he had out, and shoot along with us. This the gentleman declined. Well, a minute or two afterwards a cock pheasant rose between ‘the squire’ and myself, not five yards from either of us. Quick as lightning, bang went ‘the squire’—missed! and bang went Captain Ross—missed! Bang again ‘the squire’—missed! bang again Captain Ross—missed! and away went the pheasant, chuck, chuck, chuck! The gentleman took off his hat, made us a bow, and said, ‘Thank you; I am much obliged, and quite satisfied,’ and away he went. I burst out laughing, but ‘the squire’ was not quite orthodox on that occasion!”

That “Senex” could also make mistakes we know very well, and as he appealed to us in the letter above, we may

record an instance somewhat similar to the above, only worse, and we tell the story because it may be, after all, that on this particular occasion, even "Senex" would have been glad of some sort of assistance to his eyesight. He, as well as the writer, were one day afflicted with a succession of misses of very easy shots. Such an obvious and staggering change of form was it that we sat down and rested for a couple of hours, and discussed the situation. We had both missed repeatedly the easiest of shots, whereas as a rule, we could kill difficult ones. After the rest we began again, and the first bird—an old cock grouse—fell to the shot, whereas we had previously been unable to hit anything. We sent in the retriever, who got the bird at once, and galloped back with it. Then we congratulated ourselves once more, and prepared for a bag. Somehow, the bird slipped from the dog's mouth, a great mouthful of feathers coming away off its back, so that it showed like a man's bald head. No sooner did the bird touch the ground than it was on the wing, with four harmless barrels after it, and the bird sailed triumphantly away with its bald patch showing in the sun for a mile. Overwork was perhaps the cause of this day's failure; but, if so, how did it act, through the nerves, through the eye, or how? We are absolutely in the dark, and for that very reason we have never felt absolutely certain that the best of eyes do not sometimes deceive the brain as to what they see. We ought to say that all the above took place in the morning before lunch, and when both shooters felt apparently as well as ever they did in their lives. But it was after three weeks of hard work upon the moors. Over-exertion day after day for a length of time will spoil the form of the best shooters. On this occasion, however, it was difficult to believe that we were holding as we thought we were.

The following is an extract from a letter of Lord Walsingham to us; it describes a day's wood-pigeon shooting (121 birds killed) in the snow, and incidentally describes also, Lord Walsingham's method of shooting, if read along with the letter of "Senex," to which it refers. This is the nearest approach to a description of his method of shooting

that this crack shot has ever given ; as such we consider it of great value. We quote :—

“The greater number of birds killed during the day were nearly half as high again as the trees, some a good deal higher ; others, of course, were shot when dipping to the decoys, and on two occasions flocks of more than fifty birds chased by a falcon dashed through the branches close to my head, each bird avoiding the twigs by a tortuous line of flight which reminded one of the waved or zigzag lines across a meteorological diagram. In these cases no bird flew straight for more than five or six yards, and the pace at which they went was no less surprising than the roaring sound made by their many wings. On both occasions I signally failed to score with my first barrel, although the bird was not more than twenty yards off. The only circumstance that gave me any considerable advantage during the day was that by putting on a white shirt over my shooting-coat, and a white cap on my head, I was able to stand out in the snow in an open place having no necessity for further concealment.

“In your issue of November 24, p. 192, I read with much interest a letter signed ‘Senex.’ The way in which a certain measure of accuracy, although by no means a satisfactory measure to myself, was attained in shooting at these wood-pigeons could scarcely be better described than in the words of your correspondent. He writes: ‘I myself race the bird, as it were, in my mind without bringing up the gun: I then swing it and fire. This swing or pitch is all done in one motion.’ So far I go with him entirely, but when he adds, ‘and the gun is not stopped even after the trigger is pulled,’ I differ from him in practice. In my case the gun is stopped at the instant of pulling the trigger, having been swung as nearly as possible to the exact spot the bird may be expected to reach by the time the charge can get there to intercept it.

“No two people shoot exactly alike, and I will not allow myself to be led into a digression upon holding forward, although doubtless there is much to be said about it.

“Now, with regard to the charge used for this kind of shooting, I have always found it more satisfactory to vary my charge as little as possible throughout the season. A change in the quantity of powder, or in the weight of shot, must necessarily involve a change in the degree of rapidity with which the charge reaches the bird, and this again must involve a change in the distance allowed in front of any bird at the instant of firing. Such changes are apt to produce irregularity and to spoil good practice, and the advantage gained by occasionally bringing a bird to bag which might not have been killed with shot of a less suitable size is often more than counterbalanced by the failures occasioned through the necessity of remembering that

the charge in use is not the one you are accustomed to fire with on ordinary occasions. It may be interesting in this connection to add particulars of two right and left shots fired on January 6, bringing down four wild ducks.

"In each of the four instances, the bird was flying exactly at right angles to the direction of the gun, and not more than six or eight feet from the ground; the point at which it fell being, therefore, not farther from the shooter than the point at which the shot struck it.

"There was snow on the ground, and the distances were therefore easily ascertained with precision. Charge $3\frac{1}{4}$ dr. Hall's 'Field B' powder; $1\frac{1}{2}$ oz. No. 5 Derby Shot; gun 12-bore, cylinder, central fire breechloader, by Purdey (not choked).

	Barrel.	—	Where hit.	No. of paces.	Stepped by	Estimated distance.†	When verified by actual chain measurement.
1.	Right	Duck	Wing	91	Lord Walsingham	80yds. 2ft. 8in.	84½yds.
2.	Left	Mallard*	Head	97	Lord Walsingham	86yds. 0ft. 8in.	89yds.
3.	Right	Duck	Head	94	Derham (keeper)	83yds. 1ft. 8in.	84yds.
4.	Left	Mallard	Wing	126	Derham (keeper)	112yds.	114yds.

* This bird rose again, and required another shot to bring it to bag.

† This estimate was arrived at by measuring in the snow several of Derham's paces, which were found to average 2ft. 8in.

"The table of estimated distances is not omitted here, although possessing no general interest, for the reason that, having mentioned to some of my friends the figures obtained by estimate, I am anxious to put on record the actual distances ascertained by measurement for comparison with them. Such long shots are of course very exceptional, and must be reckoned as more or less 'flukes.' The only point of interest in this instance is the curious coincidence of four such remarkable 'flukes' consecutively within the space of less than half an hour. The charge used was the same with which the 121 wood-pigeons were killed, the cartridges being made by Johnson, of Swaffham, the successor to Mr. Parsons, one of the best known among country gun-makers of the last forty years.

"WALSINGHAM."

Possibly a kindred letter from Lord de Grey would be equally interesting; but he has never written on the subject at least, not for publication—and the best description of his

style we have seen is a letter that appeared in 1886 in the *Field* newspaper. It is as follows :—

“ Sir,—Your correspondent says he has ‘ never yet met a first-rate shot who swings his gun.’ Now, a short time ago I had the pleasure of witnessing a really first-rate shot, namely, Earl de Grey, all through a day’s covert shooting, when nearly five hundred pheasants were killed, and I observed that invariably, when the pheasants afforded time, his lordship deliberately aligned his gun by swinging with the bird, often to the extent of several yards of its flight. Once or twice when birds or rabbits were crossing a narrow open space, he put up his gun with a swing, but not getting ‘ on,’ he dropped it without firing. At one hot corner I noticed Lord de Grey firing so quickly as to empty three guns before the first one discharged could be reloaded ; and about this time I saw three pheasants falling to his gun at one time. If he missed with the first barrel, he almost always followed it with a deadly second without apparently taking his gun from the shoulder ; from which I concluded that he swung his gun from the first to the second shot.

“ It was a great treat to witness the splendid shooting of Lord de Grey, the pheasants he brought down seemed to be instantly collapsed, showing no further flight or sailing after receiving the shot. I noticed the guns used were choked in both barrels ; they were fitted with non-rebounding locks and outside hammers : the hand part, or grip of stock, was shaped very small—much smaller than is usual : the butts were minus heel-plates of any kind, the wood being simply rounded off at the edges. The cartridges were loaded with black powder and No. 5 shot.

“ At this same shoot another excellent shot (the Hon. Gore Booth) appeared to align, swing, and shoot in the same style as above described.

“ I have been trying to shoot and improve during the last twenty years on the aligning system, or swinging my gun till ‘ on,’ and before a crossing shot ; and can now generally account for my share of the bag. I have very often tried throwing the gun ‘ on ’ when there has been no time for swing, but with small success. I can throw the gun up quickly, and hit the centre of a target without aligning ; but I am entirely lost when attempting to do this at game requiring allowance forward, over, or under.

“ Aiming with the cue at billiards is instanced by some correspondents as showing how hand and eye naturally work together without positive aligning, but, though I can make breaks of forty and over at billiards, this experience is of no value in my shooting. I cannot but believe that our brilliant snap-shooters—of whom I guess there are very few—are born, not made : and therefore that the tyro had

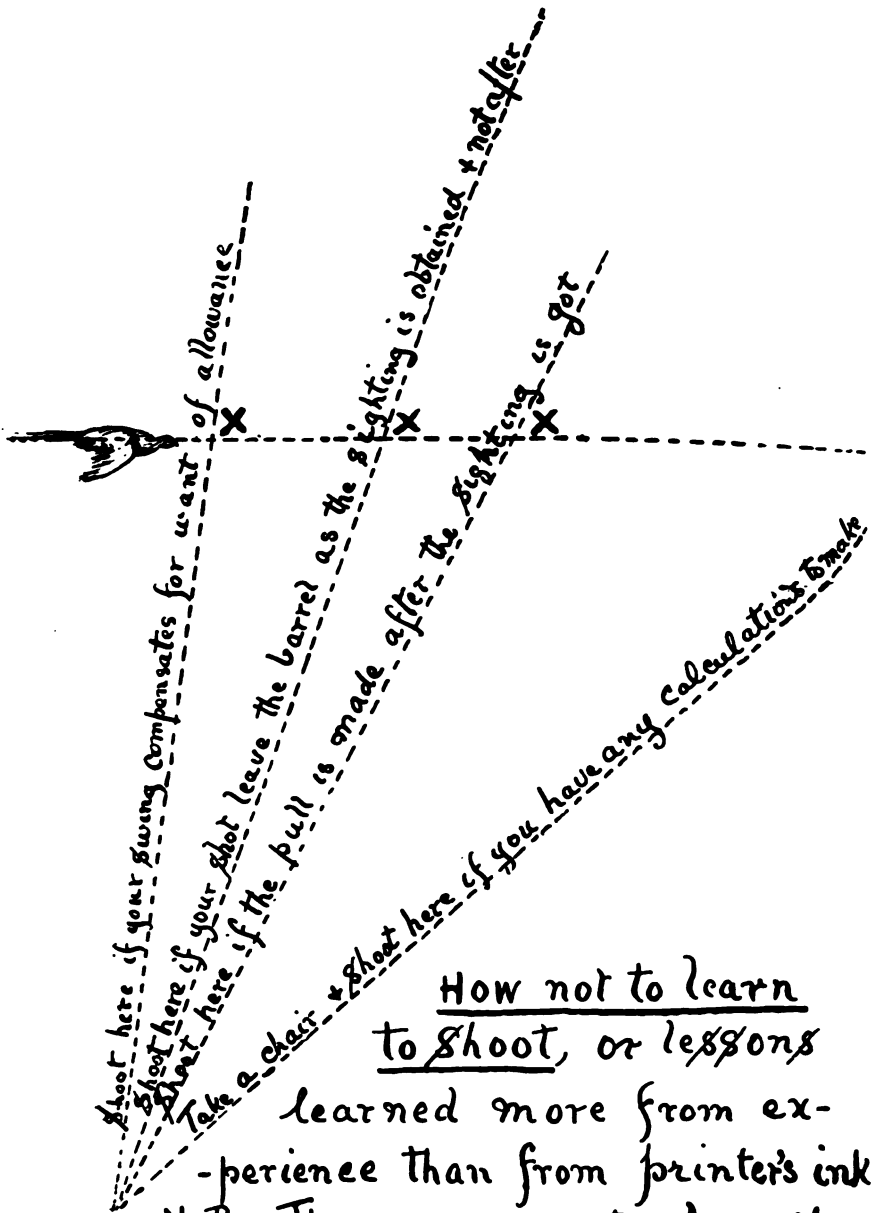
better work upon the aligning and swing system. For my part, after seeing the performance of the two cracks as described above, I shall in future be quite satisfied to go on in my old style, trying to perfect my knowledge of the allowance necessary for speed, angle of flight, and distance of moving game.

"Referring to Mr. Grace's practice of taking the gun from the shoulder after firing the first barrel, and before putting in the second, I give the following instance:—I shot for some years with Mr. B., a good shot, and remarkably quick, although he, for safety, carried his gun always at half-cock. Mr. B. shot in the style recommended by 'Mr. Grace,' and when game (or a pigeon) was sprung he fully cocked the right lock, aimed, and fired the instant the gun touched his shoulder. If second barrel was required, Mr. B. lowered his gun, then fully cocked left lock, raised gun and fired again, all in excellent time.

"When at Banchory, Scotland, a year or two ago, I had a talk about aiming with the late John Thow, gamekeeper, and a good shot. Thow aimed by swinging his gun with moving game; and, using his own words, he said 'that he never borrowed on game in his life,' which I took to mean that he never made any allowance before a crossing shot."

We have frequently been asked why we do not illustrate the various methods of shooting in a more graphic form; why we do not show how much or little to allow for the flight of game at various distances, and particularly why we have not attempted to pictorially illustrate the views expressed in the letters of "Senex" and Lord Walsingham, and the method of shooting described as that of Lord de Grey. We have explained that in our view all this is impossible, and one of our correspondents has figuratively expressed our objections by the accompanying illustration, asking us at the same time if that is what we mean.

It could not have been expressed better; not only does the difference of pace, but also the difference of distances, make the intersecting lines or crosses interchangeable. All this, however, is so very elementary that we should not, but for our correspondent's graphic sketch, have ventured to put it before our readers.



How not to learn to shoot, or lessons

learned more from ex-
-perience than from printer's ink.

N.B. The crosses are interchangeable
according to the pace of the bird

CHAPTER VIII.

THE SHAPE OF THE STOCK AND HANDINESS.

NEXT to the shape of the rib and false breech, that of the stock of a gun is of more importance to correct alignment than any other part of it. Many people would place it first, but we think when they do this they are, perhaps, not talking of quite the same thing as we are. Those who shoot in any manner in which true alignment between the eye, the rib, and the sight is not possible, will, of course, depend more on the shape of the stock than upon the rib. Theirs is a mechanical aim to a certain extent, in which shape of stock is all-important, but the shape of the stock is always of great importance to quickness of aim: consequently there can be no first-rate shooting with a stock that does not suit the shooter. American and English shooters differ in their views of what a stock should be. The former shoot with stocks far more bent than the English think well of. The result is that for true alignment the English get their heads *down*, while the Americans get their guns *up*. The position and style of the Americans is, on the average, far in advance of that of English shooters. Occasionally you see an Englishman who shoots in beautiful style with his head and body only slightly leaning forward, but the rule is a cramped position, compared with that of the American. At the traps an Englishman is frequently seen who stops his birds repeatedly nearly on the top of the traps, and often he does it with his head well up over his gun, in a position in which he sees his rib from end to end. But the same man could not always shoot well in the same style. He could not possibly know to an inch where he was shooting at fast driven game sometimes skimming the heather, then again, high overhead, and next crossing in

front, or quartering ; or still another, most difficult of all, the quartering bird swooping downwards. The man who puts his trust in the great number of cartridges he can get off from his three guns may make his bag on the pigeon shooter's method, but he who is not happy if his bag does not bear some respectable relation to his empty cases does not shoot exactly on the methods most suitable to the professional or habitual pigeon shot.

In England it has come to be general belief that a crooked stock will induce shooting under the game. No doubt when a man has been in the habit of getting elevation by looking well over his rib at his foresight and his game, a change to a crooked stock has the effect named. We go further and say that a straight stock always comes up higher than a crooked one when a change is made from one to the other. Nevertheless, it is all a matter of habit. There is no more reason for shooting too low with a crooked stock than there is for shooting too high with a straight one. In fact, there is not so much. The Americans do not habitually shoot below their game, nor the English above theirs, yet it would be so if there were any particular elevation peculiar to the different bends. With a crooked stock the left hand has to be brought up a good deal higher than the right hand. It is the habitual comparative height between the two hands that makes the shooter low with a stock more crooked than he has been in the habit of using, and sometimes it is the comparative height which makes him high with a straighter stock than he has been accustomed to, but this is not always the case. We think that any shooter used to a straight stock could train himself in a day to bring up a crooked one on the mark without any after correction of the aim. We cannot say that a user of crooked stocks could train himself to straight ones in a similar time, simply because the crooked stocked man has probably been in the habit of aligning his game accurately, and this might to him be mechanically or physically impossible with a straight stock.

The bend should be just that which, when the cheek is placed against the stock, brings the eye into position for the exact elevation required by the shooter's particular

method. Cast-off, on the other hand, should, when the cheek is in position on the stock, bring the eye into alignment with the exact centre line of the rib. These are the two broad rules of stock-making, and after them comes the art of the gunmaker. Given a compliance with those two rules, and yet the stock may be of a thousand different shapes. Cast-off, for instance, may be in one of three places, at the comb, at the heel, or at the toe, and you may have a conjunction of cast-on in one place and cast-off in the other. These peculiarities are, broadly speaking, the outcome of the make and shape of the shooter, and as they are in almost as great variety, no general rule can apply.

But there is one rule that always applies. It is the fashion to build the stock with the heel much more bent than the comb. The reverse looks bad. This being so, when the gun is forced sharply backward by recoil or kick the cheek catches the blow from the comb, because the latter is more raised than that part of the stock against which the cheek rests. It requires, therefore, merely a straight back thrust from recoil to give an upward blow by the stock. If the comb were more bent than the heel, this would not be so, but then the result would be unsightly.

What, therefore, gunmakers do is to cast off the comb, and as this part is always thinner than the heel and than that part of the stock where the cheek rests, a very little cast-off out of the straight line of the stock is enough to make the backward push of the gun relieve the pressure on the cheek instead of increasing it. This relief has become much more necessary of late years than it was formerly. When shooters thought themselves well off with twenty shots or so in an hour, a little blow on the cheek did not matter, but now, when 100 to 200 cartridges may be fired in a single drive, and 1,000 in a day, the question is all-important, and any stock that, in its back recoil or kick, does not automatically relieve the pressure on the cheek is entirely bad. That is, it does not fit the shooter, and it will, sooner or later, make him afraid of his gun, with the consequent bad shooting and want of confidence.

We do not think that the angle at which the heel plate

lies is very important. In fact we regard it as more or less a fancy point. Moreover, there is very little to be said about length of stock; the only rule is to have the stock just long enough for the finger easily to command the first trigger, and also for it to shift easily from one to the other, a point in which the shape of the handle is greatly concerned. It is a fact that the less the handle is released in changing fingers the quicker is the re-possession of control of the gun for the use of the second barrel. This is where the advantage of a single trigger mostly comes in. With one of these triggers the hand has not to move, or open and shift grip, in order to get into position to pull a second trigger. The trigger and the trigger guard often play an important part in damaging the hand by recoil. Both are often made too sharp at the edge, and then the finger gets cut. More frequently it is simply bruised. When this happens to the trigger finger it is because the first trigger recoils on to it when the second trigger is pulled; a first trigger which swings forward upon pressure from behind will cure this, but when it is the second finger that gets damaged the cure is not so easy. A small india-rubber pad fixed to the outside of the trigger guard is usually of some assistance in these cases, and there is also a sliding trigger guard made by Holland.

What is the quality in a shot-gun that we mean when we say that it handles well? It is not exclusively balance. It is a question that we have never been able to get a gunmaker to answer off-hand. Indeed, we are not quite sure that we have ever received a satisfactory reply at all, often as we have put the question. We have almost given up hope of ever having an accurate definition of the quality of "handiness." It is so much more easy to say what it is not than what it is. Gunmaking is not one of the accurate sciences. There is a very great deal of rule of thumb in it, and it is not all the gunmaker's thumb either; a good deal of it is the shooter's. The successful gun, or the successful fit of a customer, must be, therefore, a compromise between the gunmaker's necessity and the shooter's wants. When that is exactly hit off the gun "handles." When it is not

the gun feels a lump in the hand, and comes up invariably too low, especially when the shooter is getting tired. Some gunmakers have told us that nice handling is caused by an equal distribution of weight; others have said by the position of the centre of gravity, *i.e.*, by the balance. The equal distribution of weight is not a very precise term, and if we come to analyse it, we suspect it means nothing unless it means balance. This is precise, but it is not satisfactory.

There are those who will tell you the exact point in a gun at which it should balance—that is the spot at which the muzzle and the stock are apparently of the same weight, and form an even balance if the gun is suspended by a piece of string. We have never been able quite to agree that balance should be considered independent of the shooter, for the actual weight of the weapon itself has a very great deal of effect on apparent balance. It does not necessarily alter the position of the centre of gravity, but for all practical purposes it does so. The proof of this is not difficult: the most lumbering shoulder fowling-piece that clumsy workmen ever turn out now is a beautiful balance in the hands of the shooter after he has been lugging about a .577 Express. The rifle is certainly heavy in front by comparison, but so is a .303; and yet the difference between these two in balance is enormous. It is purely dead weight that causes it, and to a great extent it is also dead weight that makes the difference between the balance of a .577 rifle and a six-and-a-half pound shot-gun.

The muzzles of the .577 will always have a tendency to come up low in comparison with those of a light shot-gun of equal bend of stock. This, we think, proves beyond dispute that actual dead weight does not alter the apparent balance. If so, it goes without saying that the heavier the weapon the further back will have to be the centre of gravity, in order that the heavy gun may feel to balance in the same place as the light one. Some men are content with a pair or three guns all of one design. They are certainly the most useful where the shooting is all of the same character, or does not vary much. Other men will

have a 20-bore or a 28-bore for August or September, and will be found carrying a "grown-up" 12-bore of $7\frac{1}{2}$ lbs. late in the season, and will, with it, stop an October grouse that rises at forty yards and skims straight away low down, offering nothing but the stern shot to the marksman. Nothing can make the $7\frac{1}{2}$ lbs. as handy as the 20-bore. It is unreasonable to expect it, but all the same if the centre of gravity of the $7\frac{1}{2}$ lb. gun is as far forward as that of the 20-bore the heavy gun will be much less handy than it ought to be. It is obvious that altering the bend is the wrong way of making two guns of different weights come up equally. It is a physical impossibility for two different bends to be brought up to the shoulder and the eye in the same manner. If they should come up to the shoulder the same, then, in consequence of the different shape, they come up differently for the eye. The eye being in one place and the shoulder in another, that they may retain the same relative positions, one to the other, the stock must always be of the same shape, no matter what the weight of the gun may be. If this is not so, the result will be an after correction of aim, or a second aim, which is so fertile of bad shooting, because it necessitates slow shooting.

Any gunmaker can build a pair of guns that weigh the same and mount the same, but it is not every maker who can turn out a $7\frac{1}{2}$ lb. 12-bore, and a 5 lb. 20-bore that mount the same. The latter is altogether a higher art than the former, yet it is the one that the man of many guns most requires the fullest advantage of.

At first sight it appears curious that any two men should agree about the balance of a gun, and yet they do. The man who shoots with a straight left arm, and grasps the barrel as near the muzzle as he can, will be heard to agree with another shooter who grasps with his left hand the front of the trigger guard. We suppose that is because both recognise the advantage of getting the weight as far back as possible. We never yet heard of a gun that handled too light forward (and yet there is no doubt that for steadiness a gun *can* be too light forward to shoot

well). We have come to the conclusion after thirty-five years' experience in the field that "handiness" much depends upon what the shooter is used to. It is a common trick in some gun shops to place in the hands of a customer a gun a pound-and-a-half heavier than the one the shopman intends to sell to him. (A try gun generally weighs as much as that heavier.) The customer then at once pronounces the light gun "handy" in the extreme, and probably buys it, although it may not fit him in the least. That, we think, is another proof that "handiness" depends greatly upon the absence of averdupois. It is a curious fact that mounting a heavy gun a few times will have the effect of making even a too much bent stock on a light gun bring it up high, where it would have come up low but for the preliminary mounting of the heavy gun. We have already dealt with bend of the stock, and we think that like it, handiness is much a question of habit.

The practical outcome of this is that one should not be dissatisfied with good old guns because one happens to like the mount of a friend's gun better, especially if the latter happen to be lighter. In order to keep our heavy guns "handy" we must, if we use light ones upon occasion, change the centre of gravity of the latter more forward than in the heavy ones, so that they will not "mount" better than the heavy ones can be made to do. Correct "mount" is, after all, only the relative positions of the right and left hand to each other. That is entirely a question of habit, as we have explained in our remarks about "bend of stock." Gravity is always pulling down the left hand, and it is often assisted by the trigger finger. Sir Henry Halford's method of curing this bad habit in a pupil was excellent, and should be, if it is not, resorted to at the shooting schools. But this alliance between the nerves of the right hand and the left has nothing to do with "mount" and handiness, although the shooting schools would make allowance for it, and build stocks to counteract a bad habit of pulling down the aim with the pull of the trigger at the instant of firing. Thus, in this instance, they do not cure a fault but seek to perpetuate it.

A man should certainly be able to shoot to the spot he aims at, not merely to the spot he thinks he aims at by means of a cheat in the bend or cast-off. Handiness ought to be absolutely independent of bend of stock. Bend and cast-off must be settled on their own merits. Handiness and balance are entirely apart from them, although one is generally confused with the other. The one should be governed exclusively by the ease of position of the head in looking along the rib at objects in all possible directions. The other, "mount" or "handiness," depend upon balance, weight of metal, and strength of arm. Rather than change from a pair of old guns that have felt handy perhaps in years gone by, we would recommend a course of dumb-bell exercise, for there is nothing more certain than that the quickness of the shooter not only depends upon his nerves, but upon his muscles. It does not matter what superabundance of muscular development a man may have, he cannot be as quick with a 7 lb. gun as with a 5 lb. one—no, not if he is a giant; neither can he mount or swing so quickly with a 5 lb. gun as he can with a walking stick. We would no more recommend the 5 lb. gun than we would the walking stick for the purposes of filling the bag; all we wish to do is to induce the shooter to regard himself, on the subject of handiness of his gun, as a piece of machinery; for the laws of mechanics govern him as much as they do steam power; add to the weight, and the pace is proportionately slower. In gunnery there are very good reasons why the weight cannot be lessened, and for this reason a course of muscle-grinding is much more healthy and less costly than new and less effective guns are.

It is not everyone who cares for the slow exercise of dumb-bells, and for this reason we suggest Sandow's patent muscle-grinder. It has an unquestionable advantage over anything we know for exercising the muscles of the arms.

The shooter's legs generally get plenty of natural exercise, but he only finds out that his arms do not when he gets a hundred shots or so in rapid succession. Then it is forcibly brought home to him that a course of muscle-grinding would

have been a good thing. He will not as readily notice his own slowness at individual shots as he will notice the armache caused by a lot of shooting in quick succession. Nevertheless, when the muscles feel one they are unquestionably slow for the other.

CHAPTER IX.

CAST-OFF AND BEND.

CORRESPONDENCE is frequently taking place on the question of bend and cast-off, and it seems to be believed that the latter is a new thing introduced by the try-guns. This is not so. Some believe because they can shoot without either of these that other people can do so too. This is a very common mistake. It does not argue a very great acquaintance with the world to believe that what suits one must necessarily suit others. The late Sir Victor Brook could kill rabbits shooting from the hip, but he did not make the mistake of believing that therefore the hip was the best place to shoot from either for other people or at other game.

The man who would abolish cast-off and cast-on might just as well attempt to abolish bend of stock also. The only use of either is to enable the eye to get in a straight line with the centre of the rib and the sight. Of course, if any individual is so gifted that he can shoot without getting the eye in this alignment, neither cast-off nor bend is of the smallest service to him. But a man who attempted to do this could only shoot moderately well in any case. Certainly a stock can be so bent that the eye can align the barrel without cast-off or cast-on, but this can only be done by means of a totally unnecessary bend. Put it the other way: cast-off might be made so violent as to admit the eye into alignment without any bend whatever. But the general consensus of opinion of experts is for a little of both, for the reason that it makes a more sightly gun, and an equally effective one.

We cannot discuss the question of cast-off or bend with anyone who shoots without getting his eye into alignment with the centre of the rib and the sight. He is unique, and

disarms criticism by placing himself outside the rules of the game. If, however, anyone desires to imitate that style of shooting, we would suggest the following experiment before new guns are ordered. Take a try-gun, make it as straight as it will go—so straight that it is mechanically impossible to align the eye with its rib—and then load it and shoot at a bullseye target forty yards away.

If this is a success, which it is 99 to 1 it will not be, then it is not to be taken for granted that perpendicular and side shots can be equally well taken: they must be actually tried and succeed before the gun can be called a success, and when they have come off satisfactorily, our advice is—discard such a straight tool. The reason for this is that if a man can shoot well without the power of alignment, he is in the most perfect health. Some day it may happen that, like poor city men, he will go out with the gun in search of health. Or, to do less violence to imagination, he may be a bit off colour, and then he will find that hand and eye do not work with perfect agreement.

The reason why cast-off and bend were invented was probably not to compel a man to take unnecessary aim, but to enable him to see his mistake when it arose. When bad shooting comes on, confidence is shaken, and without confidence good shooting cannot be restored. We believe that the ability to align the rib is a ready means to the restoration of confidence. It has often happened with our experiments in trying new guns for gunmakers that we start by doing really good shooting with a gun that we are unable to align. Then suddenly shooting goes off: and this very inability to align has always prevented us getting into form again; whereas, with our own guns nothing is easier than this recovery. The reason is that with a gun that can be aligned we know what we are doing, and where we shoot; whereas, with another weapon we only know we miss, nothing more. Now we are not going to fall into the mistake we condemn, of judging others by our own weaknesses. We prefer to take the majority as our own guide when we can. In advocating bend and cast-off, we are merely repeating the

arguments that have influenced all experts, from Joe Manton (the father of modern gunmaking) to the makers of to-day. We have frequently been told that our bend and cast-off are abnormal, but we do not think so. The very straight-stocked guns—the outcome of pigeon shooting—are abnormal, inasmuch as they are special tools for special work. Some days ago we were in a gunmaker's place when he gave us an old Joe Manton gun, and upon putting it up we found it was precisely our bend and cast-off, both at comb and heel. The gun has a particularly low comb, very different from the majority of the guns made to-day. Our opinion was challenged by the gunmaker in question, but on measurement it proved to be correct to within 1-16th of an inch of bend at the comb, and to 1-10th at the heel, and if we shoot with abnormal cast-off, one at least of Joe Manton's customers must also have done so. We have had precisely the same stock for thirty-five years, and we got it, like everybody did in those days, by trying several until we found the right one. It is probable that the country gunmaker from whom we got this stock had not designed himself but copied from some weapon by Joe Manton, for there are such a multitude of possibilities in the shape of a gun stock that no two could ever be so near alike unless they were copied, indirectly perhaps. Bend and cast-off then have been considered a necessity from the days of Joe Manton at least. To alter or even modify opinion will be found a very difficult task, and one that does not appear to us worth the undertaking.

Without bend or cast-off, or some of both, it is mechanically impossible to align the rib of a gun. The object of a perfect fit is that the eye should not have to feel its way to this alignment, but that the touch of the cheek upon the stock should insure the correct position of the eye in respect to the line of the rib or of the rib in respect to the eye. The advantage of this arrangement can best be understood by those who have struggled to find a peep-sight on a rifle that does not fit while shooting at moving deer. It is that, whether the shooter wants to align or not, he sees by

simply looking at the game or the point of aim, whether the gun is pointing at it or not.

If a sharp pencil or a table knife, or any other pointed and knife-edged object, be taken in hand it is easy to bring it up quickly to cover an object just as if it were the sight of a gun. Most people can do it with one hand or the other and with one eye or the other. There are some who, using the right hand, will make the right eye the aligning eye, and in using the left hand will make the left eye do the aligning. This is an old test for sight, and to discover which is the master eye. But when one takes hold of a gun it is with two hands, not with one only, and it seems therefore, that in order to test sight for shooting, both hands should be engaged. The simplest way is the way of our fathers—put up a gun and let someone tell you if it covers the object. But although this covers most of the ground it cannot prove whether the man needs cast-off or cast-on naturally and independently of acquired habit. When a gun is put to the shoulder there is a mechanical influence on alignment always more or less present. This mechanical assistance must be got rid of if it is desired actually to find out whether there is any advantage in “fit.” That is, whether a perfectly straight weapon, made like a fishing rod or a walking stick, could be used with accuracy to shoot from the shoulder.

In order to test this it seems to be necessary to take two sharp-edged pointers, and, holding them in a vertical position, one in either hand, to endeavour at the same moment to cover an object with both of them. In the ordinary way of shooting the pointer in the right hand will represent the breech end of the rib of the gun, and the pointer in the left will represent the foresight. Put them up smartly, and if the two points are in exact alignment between the eye and the object looked at, without any after correction whatever, then it is possible that the fitting of a gun is all lost labour in such a case. But we believe that there is absolutely no individual who can bring these two points to bear exactly at the same instant of time. That is, so that one should exactly cover the other, and both cover the object looked at. We have seen many shooters attempt

the single point held in one hand, generally to their own satisfaction. But this test, representing the foresight and its alignment, is no use whatever unless it is pre-supposed that the eye is brought mechanically into line with the breech end of the gun. The pointers in both hands coming up at the same time will show how much that time-honoured phrase "hand and eye working together" has been abused. The man who fancies hands and eyes work together with extreme accuracy will, on trial, generally be as much disappointed as when he discovered how little he could hold a rifle still on first looking through a telescopic sight. He will generally find himself neither able to keep the line or the elevation either. And yet this ought to be easy to a man who can shoot with any bend or any cast-off or cast-on. It is a lesson which proves just how much time is lost in correcting the "put up" of a gun by sight alignment when that gun does not mechanically come into position with the eye at the breech end. When it does come into mechanical position all the alignment necessary is between the sight and the object; when it does not there is the same trouble, only worse, as there is to find the true alignment with a pointer in either hand. We say worse for two reasons: first, it is optically impossible to get the breech of a gun and the sight in alignment with the eye when the stock is much too straight: second, there will always be a mechanical influence in putting a gun up to the shoulder, and when that influence is not in the right direction it is obviously in the wrong. So that it is not only a question of hand and eye going together, but also one of hand and eye working together in spite of undue interference, or mechanical pressure in the wrong direction.

We are aware that people who have given but little time and study to shooting matters will tell us that we know nothing of the matter, that you should never look at the sights, but only at the game. And they argue from this that neither sights nor ribs are any good whatever, and that therefore bend and cast-off don't matter. We have had it pointed out to us that men have shot just as well as ever when they have lost their sights by accident and have been

unaware of the fact. We do not think that this proves non-alignment. The flash of light down the rib of the gun is always more conspicuous than the sight itself, and is certainly as good a guide to correct alignment. As for not looking at the sight, nobody ever suggested *looking at it*, but it is impossible to look at an object and then cover it with another object without seeing the latter. We are quite willing to admit that almost any shooter can hit a six-foot target with almost any gun. But for good game shooting it is necessary to hit a six-inch target, and there are 144 six-inch targets in one of six feet.

Quickness is so absolutely the essence of good shooting, especially with driven game, that any gun that "comes up" in such a manner as to require correction cannot be the best. So that whether a shooter can bring up one pointer correctly or not, he will always save time if the second pointer, *i.e.*, the breech of his gun, is mechanically and automatically brought up for him by the perfect fit of his stock: by the cast-off that allows the pressure of his cheek to tell him when his eye is opposite the breech in respect to the horizontal; and by the bend which tells him that when his cheek touches the stock, his eye has the correct elevation for the centre of the rib.

CHAPTER X.

THE USE AND ABUSE OF THE TRY-GUN.

WHEN Mr. W. P. Jones, of Birmingham, first introduced the try-gun for firing, we were very doubtful whether it would prove of real use or not. Later on we observed that every gunmaker almost was doing all he could to acquire the right to the use of one. Our faith in our own judgment was shaken when nearly all the gunmakers declared for the new tool. We have never reverted to our old faith entirely, in spite of the fact that now the gunmakers are beginning to slacken in their love for their bantling. The fact is that a good many gunmakers over-rated the use, as a measure, of the new instrument, and have thus become disgusted merely because they asked it to do too much. What was the mistake they made? They had been in the habit of asking a customer to put up an adjustable but non-firing gun at the eye of the measurer, and they judged the bend and cast-off necessary, and gradually altered the adjustment to meet what they saw.

The firing gun could find this mechanical line no better than the sham adjustable gun. But what it could do was to tell the gunmaker what happened between the alignment of the gun and the shot leaving the muzzle, that is, what muscular movements had influenced the direction of the gun. There are quite a large variety of nervous muscular movements that may take place in this short space of time, any one of which is enough to move the gun off the alignment. The most common of all is a sympathetic impulse between the trigger finger of the right hand and the holding, or left, hand. When this takes place down goes the gun, and a low shot is the result.

This fault in its mildest phase only affects still or

straightaway shots, for when there is any swing on the gun there is obviously little chance of the gun moving in a contrary direction. This is only as much as to say that the muscles cannot make two opposite movements at the same time. Where can the try shooting gun go wrong here? It discovers that at a stationary target the shooter is low. The cure is to straighten the stock, and the cross shots of the shooting schools are of such mechanical character, every shot exactly like the other, that to put up and shoot a certain distance in front is a habit learnt in a few shots. Swing does not enter into it, and there is in consequence no check on the mistake made by the try-gun at the still target.

I know that some gunmakers will not admit that it is a mistake to correct a muscular movement by means of bend of stock; but of them we would ask what happens in game shooting, when there is any swing on, to a man whose gun is set to shoot a couple of feet or so over his game, and who has to rely upon the drop of his left arm to get his game into the killing circle of the shot? When there is much swing there is obviously no involuntary drop of the barrels; momentum prevents, whatever the muscles may do. Here, then, instead of correcting a fault, the try-gun has perpetuated it, and added to the difficulty by making the cure only applicable to some kinds of shots and not to others. We are reminded at this stage of the absurd fashion in vogue of having various bends for various shooting. Thus, a straight gun for pigeon shooting, a crooked (according to Captain Money) one for clay birds, and perhaps another for game. We have no hesitation, all the same, in saying that a man who cannot shoot all sorts of shots with one bend is not properly fitted.

Yet had the information given by the try-gun in the above instance been properly used it would have been the making of the shooter. There is nothing much easier to cure than this sympathetic movement between the right first finger and the left hand. The stock-in-trade necessary for it is merely a batch of cartridges three parts of which have got dummy caps in and cannot be exploded.

This is an improvement on the late Sir Henry Halford's methods of teaching a man what he is doing. Sir Henry loaded the gun for the pupil, and occasionally put in no cartridge when one was expected, and at other times put in a cartridge when an empty gun was expected. By this means the pupil had not to be told, but he saw for himself, how he pulled down his weapon with the pull of the trigger, and he could discover for himself the reason of it. He also saw that when he thought there was no cartridge in the gun he could snap it off in a manner to make bullseyes; for this very good reason he made them when he did not expect to fire.

With ordinary cartridges it requires some sort of an assistant to deceive the pupil. With dummy caps intermixed with a lot of cartridges otherwise exactly like the dummies there is no need for an assistant or a teacher, and it is wonderful what a great lot of fairly good shots will find themselves dropping the gun with pull of the trigger. Probably their gunmakers have already given them a compromise, that is, a gun that shoots when held still slightly over the mark, but not enough over to make them miss fast-crossing game altogether, in consequence of swing. Of course, this compromise results in shooting slightly under going-away game and slightly over crossing game: but that is not good shooting and does not effect clean work.

It has been attempted to explain how a temporary fault in the shooter may be established as a permanent defect by a too great reliance upon the try-gun. Although this sympathy of the two hands with each other is about the most common fault in shooting, and accounts for the inability to hit the plate in the centre of many a fairly good shot at game, it is by no means the only defect that the try-gun has been set to cure. Defects in eyesight are very common, and it is very strange that, in spite of Sir Ralph Payne Gallwey to the contrary, with whom we cannot agree on this occasion, it is not only possible but a frequent occurrence to find men shooting from the right shoulder who align the game, the foresight, and the left eye, some entirely, others partially. Those who do it, it is true, as he says, cannot align the rib

with the left eye, it is mechanically impossible. What they do is to align the rib to the right eye, but they put the bead on the object between it and the left eye. This is even easier to a man who does not align his rib at all, and there are many shooters who do not, and whose guns are so straight that they could not accomplish the task if they would. The firing try-gun is not superior here, because the throwing up of the gun at an object is all that a gun-maker desires to see in order to suggest a cure. The cure can be of different kinds: (1) a treatment of the eyes; (2) an amount of cast-off that shall bring the rib at the false breech opposite to the left eye; (3) shooting from the left shoulder; (4) shutting the left eye.

But there is a middle way between aiming with the right eye and aiming with the left. There are, for instance, gunners who with both eyes open are influenced by the left eye to pull the muzzle over towards the left, and yet in reality do not put the bead on to the spot with either eye, although they think that they do so. Here again the try-gun has tampered with the defect and encouraged it to continue. Cast-off has been given to counteract mechanically the optical defect. Soon the shooter gets used to the greater cast-off, and the bead once more finds itself somewhere between the line of the two eyes, and as Mr. H. Harriss says, a deformed gun is the result; no permanent object has been gained. It is perfectly true that aiming is not all a question of the sight, the touch has a great deal to do with it, and if it were possible to deceive the touch it might also be possible to cure erroneous aiming by cast-off and cast-on. It is possible to do so for a short period, but the senses soon find out—perhaps not during measurement at the shooting school, but afterwards, when the new gun has been built. Mr. Watts does not use a try-gun. Mr. Purdey believes that the responsibility of a try-gun would involve the constant alteration of stocks to meet the daily changes in the men themselves. Cures by deceiving the eyesight and the touch by radical changes cannot be more than temporary in their effects. To all such as are troubled with defective vision we might, without fear of laying down the law, say

that the gunmaker is not the doctor wanted, and that the oculist and the optician are the first necessity. After their assistance a man will generally find himself able to align a gun with the eye that he wishes to align it.

It is true that neither the one nor the other will be able to give a man both long and short sight with the aiming eye. As we get older our sight alters, and we can no longer see as perfectly at three different distances as we used to. For instance, if we feel that the highest form of accurate shooting is only to be attained in the way that Mr. Froome shoots a rifle, that is with both eyes open, with perfect definition of the rear and the fore sight and the object with the right eye, the oculist can assist if he is not asked to do too much. A rifle-like aim is an absolute cure for the interference of the left eye, and nobody can say it is impossible to take it quickly enough after seeing some of the crack shots put in double bullseyes to a single run of the deer at Bisley. The proper thing to ask from the oculist is not that you may see the three distances with equal clearness with the aiming eye—that cannot be done with defective vision with anything less elaborate than the telescope—but a single eyeglass is generally enough to make definition good at the false breech and the foresight. Then the shooter may trust to the left eye to place the alignment on the mark; especially safely if the left eye is unable to see the foresight; not so safely if it can see it, and still less safely if it can see it with exact definition. Mr. Gilbert's two-eyed sights might be useful to such eyes as these, but the oculist will probably succeed without them; if not, the indiarubber thumb-stall, illustrated in a previous chapter, will be all that is required to prevent the left eye seeing the foresight. The unsuspected ability to align the sights with one eye and to place that alignment upon the mark with the other is common to everybody, and has been fully illustrated in a previous chapter. Our view then is that no bad shooting consequent on defect in eyesight should be attempted to be cured by the measurements of the try-gun. The only thing against the oculist's assistance is that by radical treatment of the eyes by means of glasses it will, perhaps, happen

that the means of judging distances of the game will be impaired. That is serious when it happens; we do not think there is any means of making one eye judge distance as well as two, and if there is a defect in one eye the same rule applies—only to a less extent.

There is a fallacy that aiming in the sense of aligning the rib spoils time. It may be so when the shooter has to struggle with his gun for the alignment, but not if the gun fits him. A gun is supposed to fit a man's shoulder. Really, it is much more important that it should fit his face. One day, not so very long ago, we were watching a most excellent gunmaker shoot, and he explained to us that at certain angles his gun always hit his face unpleasantly. Could there be anything more condemnatory of the fit of that gun? We know of nothing. A few shots in rapid succession at that particular angle would unnerve him for the rest of the day.

There are nervous habits that are much more readily detected by the assistance of the try-gun than without it. Provided a man aims correctly always at the gunmaker's eye, he will probably do so at the mark, and yet he will often miss all the same. Some nervous trick, possibly a tightening of the grip when pulling the trigger, interferes with the direction of the shot. The tightening of the grip always affects the alignment. Perhaps the shot always goes into the same place to right, left, high, or below the mark. The cure is improperly given in bend or cast-off if so, and although the try-gun has found the mistake the adjustment of stock will not cure it permanently. The cure, if it is not to be of the nervous habit itself, ought to be in the lie of the rib, that is, the barrels should be set to shoot at a point where the rib does not aim—thus untrue to alignment of the rib. This is the only possible way of deceiving the touch and the eye permanently, for both will accommodate themselves to cast and bend of stock in a very short time. The same cure is not so applicable to defects of vision, because there are limits to the variation of the line of the rib as compared with the barrels.

Still, a try-gun is of use, for few men put up a gun in

the same way when they are not going to fire it at the gunmaker's eye as they do in actual shooting. But even the try-gun is liable to the same error. The great thing seems to be to try a shooter at snap-shots, whereas nine-tenths of the game he will afterwards shoot at will not require snap-shots. It is certain that a gun which does not suit, say at driving grouse, may do admirably for such shots as rabbits give. Neglect of getting the head down, as usual, for alignment influences the direction, and it would do so equally if the shooter were unconscious of ever aligning at any time. Snap-shots, such as those at rabbits crossing rides, are comparatively easy, and we do not think that a shooter educated upon them, and with a gun built on lines indicated by such education, will ever be quite satisfied when the only difficulties to overcome are pace and allowance. To allow accurately you must align correctly, and this is so whether you align at empty space in front of your game, or whether, having aligned the game, you jerk or swing the gun in front. True alignment is in either case absolutely necessary, whereas in snap-shooting you do not get the head down to align.

We think that the greatest use of the try-gun, after all, is that it can be set under direction of the shooter to his own bend, and with it thus adjusted he can at any time have practice at the shooting schools and find out whether he is making the correct allowances. But in order to do this it is essential that he should have time to see his game, that the game should come at all sorts of paces, from extremely fast to slow, and that the attendant should be able to tell him exactly where he has placed every shot with respect to the game.

CHAPTER XI.

CHOKE-BORES OR CYLINDERS.

THE theory and practice of shooting forward never seem to agree. We all acknowledge the theoretical necessity of shooting forward; we none of us subscribe to the distance theory says we ought to shoot before our game. Even great shooters cannot agree over this subject except in this, that they all condemn the theoretical distances as absurd and impossible; but a great deal of the disagreement is merely a different use of terms. What, for instance, is "swing"? Sportsmen are apt to use it to express two totally different things. Here is an instance of what we mean, being a quotation from a letter already published :—

"Now, a short time ago I had the pleasure of witnessing a really first-rate shot, namely, Earl de Grey, all through a day's covert shooting, when nearly five hundred pheasants were killed, and I observed that invariably, when the pheasants afforded time, his lordship deliberately aligned his gun by swinging with the bird, often to the extent of several yards of its flight. Once or twice, when birds and rabbits were crossing a narrow open space, he put up his gun with a swing, but not getting 'on,' dropped it without firing. At one hot corner I noticed Lord de Grey fire so quickly as to empty three guns before the first one discharged could be reloaded, and about this time I saw three pheasants falling to his gun at one time. If he missed with the first barrel he almost always followed with a deadly second without apparently taking his gun from the shoulder, from which I concluded that he swung his gun from the first to the second shot."

The writer here, in our opinion, correctly uses the word "swing." There are the double acts of following the game up and "swinging" in front. We regard this latter term as anything that is done to get in front of the game, whereas

"following" is a lower form of the same thing, and merely means trying to catch up the game for alignment when the gun is at the shoulder. Following round is usually

condemned by the oracles, and when it is done to excess, and to danger, so it ought to be; but all the same, alignment of a fast-coming-over bird cannot always be got without it. It is evident that if the above letter correctly describes Lord de Grey's method he not only "follows" to get alignment, but also, afterwards "swings" to get in front of his game.

But "swing" is a term that has been used to do duty for something different to either of these actions. In a letter to us, quoted at length in a previous chapter, Lord Walsingham seems to understand the term to mean throwing the gun up to the shoulder and ahead of his game in a single action. It is not the ordinary sense of the term, and we think this action best described as throwing up the gun to



Fifteen feet column of shot from choke-bore, showing position of pheasant A, well timed for 40 yards, and position of pheasant C, well timed for 20 yards and badly timed for 40 yards.

a point ahead of the game. He was describing shooting at wood-pigeons, birds that, as every sportsman knows, go

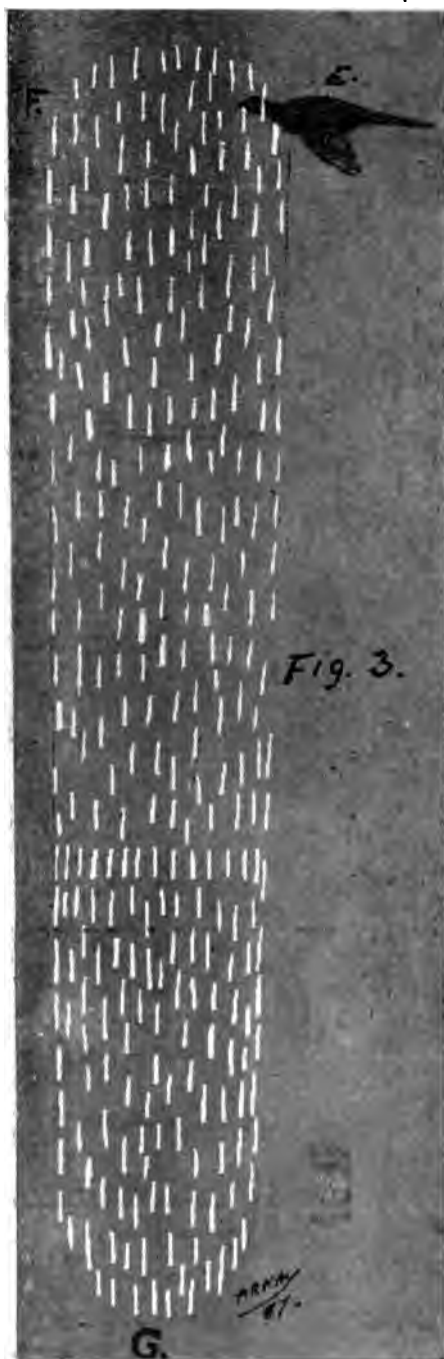
off at a tangent the moment they see the sportsman move to raise his gun. Game birds do not do this, although teal on occasion can shoot thirty yards perpendicular into the sky as they see the shooter raise his gun, and be well out of shot by the time it is up.

Game birds, when they once have selected a line of flight, are comparatively very hard to turn. Why, it is difficult to say, for when they are on foot they are sensitive to the faintest movement, and a gun standing outside a covert where he can be seen by the running pheasant will get no sport if he is not as still as a statue. Hares and rabbits are not half so sharp-eyed as game birds, especially pheasants, but even they will not come to a gunner who cannot stand still. We have always had wonderful luck in obtaining a fair share of the bag wherever we have been shooting, and it has been mostly in consequence of the inability of many sportsmen to stand still and to "hold their noise," as they say in Lincolnshire.

The late Bromley-Davenport described how you should, by shooting in front, only hit a rocketeer in the head and neck. So much depends upon the distance. Up to twenty-five or thirty yards it is possible to shoot for the head and neck, but



Showing pheasants A and C, as in Fig. 1, when the column of shot has passed.



20 feet of cylinder column of shot, showing position of well-timed shot in regard to pheasant E.

beyond that distance to do so would be to run great risk of missing altogether, or only hitting with the last and weakest pellets in a charge, as may be seen by examining the position of the pheasant, (C', in regard to the column of shot represented in Figs. 1 and 2. In Fig. 1 he is entering the column as it has mostly passed him, and, if anywhere, he will get the shot in the head and neck. This is likely enough at twenty to twenty-five yards, but it is very unlikely when the column has lengthened out, as is here represented. A. in the same column of shot, represents a pheasant just entering the column to a well-timed shot, just as it reaches his line of travel, which is towards the point B. In Fig. 2, this bird is represented to have passed the point B, considerably before all the choke-bore column has come up. This is because he has to fly only 2 ft. or 2 ft. 6 in., while the slowest of the shots are travelling 15 ft. He is going possibly one-fifth their pace, and will get through when they have covered about 12 ft. 6 in.

out of the 15 ft. With a cylinder gun, as in Figs. 3 and 4, the bird has to go twice the distance to get through the column of shot while it is passing his line of flight. This he cannot do, and so he gets the full benefit of the cylinder pattern, and only a portion of that of the choke-bore at forty yards from the gun.

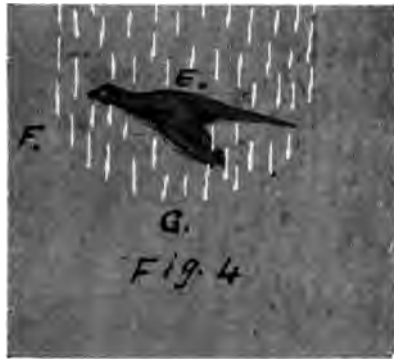
This perhaps has something to do with the popularity of cylinder guns for game shooting, in spite of the fact that choke-bores hold the field for pigeon shooting. It is easy to understand, therefore, that a cylinder may put more shot into crossing game than a choke-bore, even if equally well directed, and it is clear that the difference of the patterns at a flat target is deceptive.

The degree of inaccuracy of aim that may, nevertheless, by luck, score with the cylinder is also very much greater than with the choke-bore. In Fig. 5, representing a cylinder's column of shot, 4 ft. across and 20 ft. long, H represents a pheasant having almost passed before the shot arrive—a kill, perhaps, with a stern shot, with broken legs most likely. I represents a

bird just entering, shot having just the proper allowance in front, and J is a pheasant whose head and neck enter the rear of the column of shot just as the last of it passes the bird's line of flight, and therefore, represents the utmost possible allowance in front with a just possible kill.

This bird is shown in two positions. First, in his proper distance behind the other two birds in Fig. 5; second, as he would enter the rear of the column of shot in Fig. 6, when he had arrived at the line of flight of the shot—the latter still going five times the pace of the bird

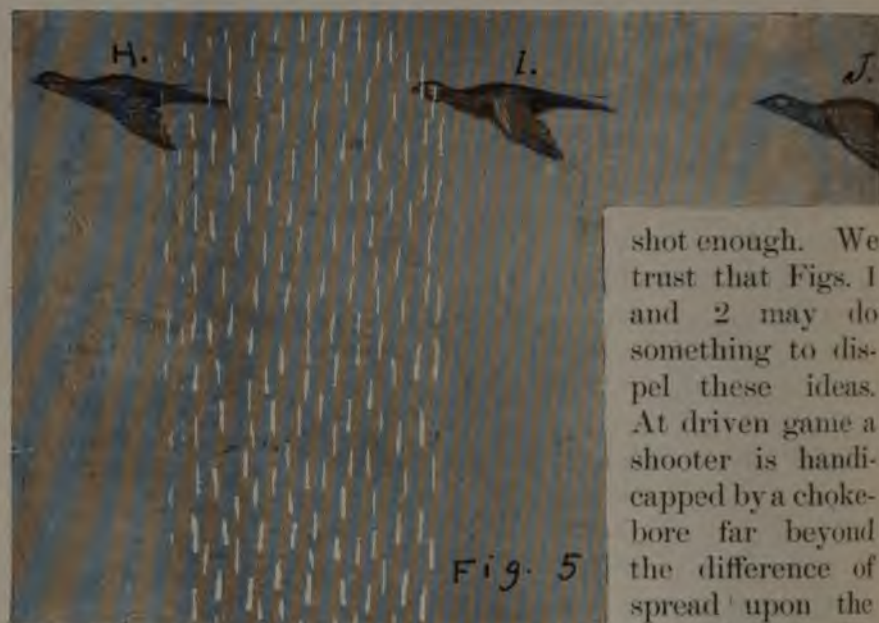
It will be seen then, that here is a possible variation of 8 ft. in the position of a bird when a kill results. A very high choke-bore will give about 3 ft. less, or 5 ft. variation



Position of pheasant E when column of shot has travelled 20 feet.

in the comparative positions of the game and the shot, yet resulting in a possible kill.

But this only applies to the distance of variation on the correct line of flight. Once deviate from that line, and, as we have previously tried to make clear, the chances of hitting with each kind of bore vary, not by square measure any longer,⁵ but by the cubic space covered by the shot. It is a common assertion of the choke-borers that if a man cannot shoot with a choke-bore it is because he is not good



Showing greatest degree of inaccuracy of aim possible with 20 ft. column of shot from a cylinder gun.

shot enough. We trust that Figs. 1 and 2 may do something to dispel these ideas. At driven game a shooter is handicapped by a choke-bore far beyond the difference of spread upon the target between its and the cylinder's shot.

In another chapter we have stated the lengths of the columns of shot, based on Mr. Griffith's measurements, to be at forty yards from the muzzle, twelve yards for a cylinder and nine yards for a choke-bore. These results were obtained by measurements obtained by Mr. Griffith's revolving target. This turned at the rate of 200 ft. per second—less than a third of the mean velocity of the shot over the distance between the first and the last pellet. The photographs of targets taken in this way have therefore to

be multiplied so as to be equivalent to making the target revolve as fast as the shot travelled. Here we have taken 20 ft. column of shot from the cylinder barrel instead of 36 ft., because in practice the straggling shot do not count for much. A careful examination of Mr. Griffith's photographs of revolving targets, and a lively remembrance of pellets that had no power to get beyond a rabbit's skin (anyone who is shooting rabbits will, if he passes his hand



FIG. 6.—The pheasant J represents how the last pheasant, Fig. 5, will enter the column at the moment of its passing his line of flight.

over those killed, find a large proportion of shot have penetrated only the skin), assure us that we do well to neglect to count on the slower pellets. Yet, if anyone believes they are of service he may in theory add three feet to the eight feet of inaccuracy of allowance permissible for the cylinder, and make eleven feet of it, and one foot to the five feet of the choke-bore, and make six feet of it. In practice he can do nothing of the kind; and surely eight feet of possible

variation ought to be enough for anyone at forty yards. We think it is enough to explain the difference between the theory and practice of aiming in front.

A bird going sixty miles an hour—no unusual pace in breath of wind, to say nothing of a gale—travels thirteen feet while the shot travels from the muzzle to forty yard distance. This reduces the absolute necessary allowance a well-timed shot to anything between five feet and thirteen feet, for the spread of the shot, longitudinal and lateral accounts for eight feet of it.

We do not regard the personal equation nor the time ignition after the pull of the trigger; if we did, these would be constants, and necessitate additional allowance always. We do not regard them, because when a shooter is in form he times his shot to leave the barrel as he gets his aim; he does not time himself to pull the trigger when he gets exactly on the spot, but when he sees that he is going to get there. The variation of allowance necessitated by a too hard, or too light pull off, ought to prove to anyone that a pull, at any rate, is made allowance for, and actually takes place before the gun comes to the desired spot. A well-known phase or quality always present in good form is when the hand and eye work together. It is in everybody's mouth and yet it would have no meaning unless it meant that the hand is obedient to what the senses tell the eye is going to happen in preference to what has happened.

We think that the following analysis extracted from the columns of *Land and Water*, in 1877, will answer the purpose of setting out this point clearly:—

"Sir,—I am always glad to be of use if I can, but I doubt whether I shall be able to satisfy your inquiring correspondent, 'One Wishing to Learn.' I was careful, when I first wrote to you a fortnight ago, to say that what I considered the first rule and the only rule which can apply to everybody is:—

"Q.—Every man being different, his success will depend upon different and often opposite rules?

"A.—Believing this most thoroughly, how is it possible I can 'lay down the law'? I can only reply to most of these questions, subject to differences of individuals. To begin:—

"Q.—In what position is the gun held when at the ready?

"A.—That rather depends upon whether the shooter shoots from the right shoulder or the left. Perhaps I can best reply by getting on to the next question.

"Q.—Should the 'ready' position be the same in the butts as in the open?

"A.—Distinctly no. In the case of a right-shouldered man the muzzle will be held bearing slightly to the left and upwards in the butts. This position would be exceedingly difficult to keep in a day's tramp upon the moors. Nevertheless, as near to it as can be made comfortable to the shooter should be maintained when game is expected, especially if wild shots are to be accounted for. The gun will be carried with the muzzle pointing still more to the left in walking up game, but never so much as to cover, by any excuse, the man walking further to the left, and the muzzle should always be well up, or down, so as not to point into a man who happened to be, by accident, in its line. I am doubtful whether it is correct to speak of the 'ready' in walking up game, for unless game is immediately expected, the gun is not carried in a position answering to the 'ready,' but is thrown into it by the action which afterwards brings it to the shoulder. Watch a shooter surprised by a rise of partridges, and you will observe that the arms and muzzle are first extended in the direction of the birds, the gun going up pointing their way before it is brought to the shoulder. If the birds are going straight away it is pulled straight in, and the shot leaves the barrel as the stock touches the shoulder; if, on the contrary, it is a crossing shot or a tall pheasant, the action is the same as in the butts, from the moment after the gun has reached its furthest outward position (never having stopped, for it is almost a segment of a circle which is described by the hands) it crosses the game as the stock comes back to the shoulder, and keeping in the same line with the moving quarry, the trigger is pressed at that instant which the shooter *feels* will enable the shot to leave the muzzle as soon as he has got it to the proper distance in front: *in his best form that instant will be as the gun touches the shoulder.* The best shot in the world is not always able to insure the success of this method; if he is out of form he will 'poke at 'em' and 'follow,' like his neighbours, until he has 'felt his fingers,' that is until form comes back to him, and by this poking and following he will kill *if he has time.*

"Q.—And do I understand him rightly, that when the gun is properly wielded, the swinging is done with the butt away from the shoulder, as the gun is rapidly brought up from the 'ready' position to the 'present and fire' in one same instant; and that the butt

ought not to rest against the shoulder until the shooter, having made up his mind where to send the shot to intercept the line of flight of the game, swings up the gun from the 'ready' position to the present, and pulls the trigger instantaneously as the butt touches the shoulder? Ought 'swing' merely to be the movement from the 'ready' position to the present, or can it also be a correction of the aim afterwards?

"A.—The first part of this question I have already replied to as well as I am able; to the latter portion, I do think 'swing' *ought* to be accomplished before the gun touches the shoulder, but, as I have before said, it cannot always be done, even by the best shots, so that what 'ought to be' and 'what is' are not always identical. 'Swing,' it should be remembered, has no technical meaning other than its dictionary one; it may therefore descend into 'following.'

"Q.—I presume the gun ought to be kept still at the 'ready' position until the shooter has made his instantaneous calculation, as the driven bird comes into range?

"A.—Certainly, no movement should be made until the gun is quickly brought up. But I fancy a great mistake exists in thinking the shooter can tell where to shoot while the gun is still at the ready. The successful point, in my opinion, is never settled until the gun is on the point of covering it. Indeed, it cannot be termed a point at all, it is a line in the direction of flight, and when the gun has covered a certain space more of it than the bird has, the trigger is pressed.

"Now comes the most difficult question to answer, and yet the most unimportant, I believe.

"Q.—Should the swing cease as the gun comes to the shoulder, or should it be continued afterwards?

"A.—To the beginner I would say, swing on, because you can do no harm by attempting it, and you may do harm by attempting to check your swing. The experienced shooter, however, allows the kick to stop the swing willingly, for two reasons:—First, he knows the shot have left the barrel before he feels the kick; second, he cannot help it.

"To young shooters wishing to kill driven game I would suggest that they should do exactly as crack shots do when they are feeling for their lost 'form,' that is, take lots of time, get on the advancing bird with the gun at shoulder, if the line cannot be got earlier, and then bring it away in front, and pull as it comes without attempting any check whatever: by these means they will have started on the right road, and they have only to learn to put on the steam, as it

were, which they will readily do as they gain confidence. I fear, however, I am a poor hand at giving advice, although I know many better shots who are much worse.

“AN OLD INDIAN.”

It will, we fancy, be clear to many good shots that we have not in practice got near enough to our game even yet. They neither make an allowance of thirteen feet, nor five feet either, and yet they kill. Sir Ralph Gallwey advises the aiming the length of a pheasant before the bird; three feet would not do for us, but we can, nevertheless, understand its doing perfectly well provided the swing is enough. We may agree with “An Old Indian” that recoil stops swing, but we know that the shot are out of the barrel then, and it is clear that any lateral movement of the barrel imparts lateral momentum to the shot. Anyone who has seen parcels thrown from an express train on to a platform would know that momentum imparted at right angles to a momentum already acquired does not counteract it. We think that if anyone could swing his gun muzzle at the rate of sixty miles an hour he need give no allowance to birds travelling that pace. Swing, however, cannot be accomplished at such a pace. The shooter is figuratively the axis of the circle. The bird is on the outside circumference. The gun starts behind and gets past the game in alignment, but, after all, it does not take much real speed to do that. But whatever value is got out of the lateral momentum, and it must be some (for a shooter cannot swing fast and stop suddenly, however he tries to do it), it all goes to reduce the necessity for allowance in front. Thus, the quicker the bird the quicker the swing, and the more lateral momentum the shot gets. This is, to a certain extent, a mechanical estimate of speed of game, and acts accordingly. With us it does so up to twenty yards or so, but beyond those distances we cannot say it does. Fast crossing birds are always more difficult when high up or a distance off. The reason appears to us to be that, being further away from the axis of the circle, they are at the same speed of flight, moving apparently slower, necessitating a slower movement

of the gun to keep up with and get in front of them, and it is in consequence of this, and the slower speed of the shot, that so much more apparent angle or allowance is necessary beyond thirty yards than nearer.

Another possibility is that if a shooter swings in front of his game, and without attempting to stop the gun, pulls trigger as it gets three feet ahead of the bird (Sir Ralph Gallwey's method), there is no knowing how much his gun points ahead when the shot actually leaves the barrel. To the individual shooter it may be a constant, but as it will vary with the speed of the swing, and therefore with every shooter, it is best, of course, for us to leave it severely alone.

CHAPTER XII.

PIGEON SHOOTING.

The sort of Gun and Charge used.

PIGEON SHOOTING is a growing amusement in the States of America, whereas in England it is a survival. We do not remember that anyone had written a book exclusively about pigeon shooting until Captain Money produced "Pigeon Shooting: by Blue Rock," which first saw the light in an American newspaper—*Shooting and Fishing*. Pigeon shooting is not a subject that appeals to us very much, nor can we, like Captain Money, call it a sport. It ranks as an amusement, and as a test of skill, just as target shooting at Bisley does. It does not even lend itself to the cultivation of the kind of skill that is required in sport with the shot-gun. This is not merely our opinion, it is that of Captain Money as well. In the first place, you shoot Pigeons with a gun and a load that you would never dream of shooting game with, for your object is to plaster your pigeon, and render it thereby totally unfit for food. It is, therefore, a very long way—just as far as it can be—removed from the practice, objects, and intentions of the game shooter. Not only are the gun and the load different, but the very position of the shooter and the way he holds his gun are at variance with those prescribed by necessity for game shooting. Captain Money's opinion is valuable for several reasons: his pigeon shooting has not been confined to Hurlingham or the Gun Club, but has ranged through the New World. That is not all. Captain Money is a clay-bird shot, too; and he tells us in his book that he has had lots of game shooting.

He has made a study of guns and patterns for pigeon shooting and for clay-bird shooting also. His view is that

to shoot these two well the shooter must so far go in for them as to treat each as totally different from the other; neither the same load, nor even the same gun, will do for both. For the live bird he tells us we must have a straight-stocked gun and stand up well above the rib, because the pigeon is mostly rising. For the clay-bird, on the contrary, he advises a well-bent gun, because the clay does not go far before it describes a curve downwards, and the shooter requires to shoot under it. We cannot think that the shooter is a fine game shot who cannot take one fit of gun for every kind of shooting. Shooting that necessitates a special gun, one that will not do for game, will never become popular amongst game shooters. The cultivation of two distinct methods of shooting, requiring different guns, cannot serve to make perfection in sport in the field, for the latter may call forth the utmost resources of either, or both, in the space of half a second. When we hear of a crack shot at the traps, it does not convey to us information that the shooter indicated is even a moderate shot at game. We know that to become a crack shot at pigeons he has to abandon the best methods of bringing up his gun to align any possible target that game can offer to him. Captain Money describes the method for pigeon shooting. A straight stock that you cannot really align from the breech, in order that by placing the bead on the pigeon the shot may pass, well above the point aimed at, and to where the pigeon is rising. We do not challenge the method. It is the usual one, and has succeeded more often than any other. All we say about it is that it is not good from a sportsman's point of view, other than a pigeon shooter's. At a sinking bird instead of a rising one it would be exceedingly difficult to know what one was doing with a gun that one could not align along the rib, but must perforce look over; and game is certain to be sinking upon frequent occasions.

It is well for the game shooters who come up to the scratch so nobly during International week to be aware that in sticking, like sportsmen, to all-round methods, they handicap themselves severely. They have to compete with men who make a business of it, and who care less for their

general form than they do for winning at pigeon shooting. It must always be quicker to aim at your game than at a point a certain allowance above it. The straight stock enables a bead to be drawn dead on the bird, and, at the same time, the shot to go a certain distance above the point of aim.

Then the loads used for pigeon shooting, and even those recommended by Captain Money for clay-bird shooting, are not fit for game shooting. Fancy shooting fifty-five or sixty grains of E.C. and $1\frac{1}{4}$ oz. No. $7\frac{1}{2}$ at a grouse in August or a partridge in September. We do not want to save the cook the trouble of plucking the game, and we do not like it minced, feathers and all.

If we go in for clay-bird shooting it is as well we should know what is before us. Captain Money tells us of American shots who have made runs of 150 breaks, and of many who can average 95 per cent. of breaks. Captain Money points out that this would be impossible unless the gun and the cartridges were right. No gun that occasionally makes a wild shot will do it. Here is a target that sideways, as it flies, is little bigger than a sparrow. Captain Money thinks it is seldom shot at less distance than thirty-five yards, and frequently not until it has got forty-five yards. It is obvious that to succeed the shooter must get a gun and a load that will not let this small object through at the distance at which, on the average, he gets his aim. If that be thirty yards, then he must satisfy himself that every time at thirty yards he can make a pattern with the shot so near together that the target cannot get through, but it must not be closer together than this makes necessary, because he wants as wide a spread as possible to cover any inaccuracy of aim he may commit. For the second barrel the trial will have to be similar, but at an increased distance, and he must not be satisfied with one dozen shots or so, but he must see that with a certain load he can get 100 similar shots with no occasional balling, nor wild, wide-spreading shots. The barrels should each make the same pattern upon the target at varying distances, ten yards or so apart. We cannot say that for the first barrel we should ever follow

Captain Money's advice about using fifty-five or sixty grains of E.C. and $1\frac{1}{4}$ oz. of shot. We are convinced that a light load in the first barrel enables a quicker shot for the second. It is no question of strength. The gun must recoil and the shoulder recover position before a second alignment can be taken, even if a man has the strength of Samson himself.

An exactly similar proceeding is necessary for the test of a pigeon gun, the two barrels being patterned at distance according to the shooter's handicap, and according to his quickness, or the reverse, with the second barrel. Here however, the object is not merely to touch the pigeon. A scratch will generally break the clay, but the live bird requires smothering with shot that have force enough to reach the vitals through the backbone and feathers. The object is not merely to kill, but to kill dead on the spot, and practice at real good birds is necessary as much to try the gun and the charge as the shooter.

It will be apparent that either of these pastimes will necessitate a very great deal of practice at the plates; either by the gunmaker for the shooter, or by the shooter himself. No gun can be loaded to do exactly what is required offhand. "The usual load" is almost certain to be the wrong load for the special purpose in view, although it may be exactly what is required for game shooting. In plating a gun it is well to take absolutely nothing for granted. Every gun has an individuality, and always must have as long as gunmakers have to regulate barrels by shooting and rebarreling alternately. If they could all be turned out exactly to measure, the elasticity of the metal would still vary, and this variation is quite as important as more or less choke, although the latter is easy to measure and the former is not. Guns made, therefore, more or less by rule of thumb must be treated after diagnosis. That is to say, they must be tested in every possible way to see what is wrong with them, and with what load they perform the best. Neither cartridge case, nor primer, powder, nor wadding can be taken for granted. Possibly it will be found that two loadings shoot equally well, and if that is so, always lean to the light one for the first barrel, and

the heavy one for the second. Never shoot pigeons with a gun that you cannot plate to the centre every time, shooting quickly. Such a gun either does not suit the shooter, or else it has some bad fault of construction, probably the latter.

Gunmakers hardly ever re-adjust the barrels of a shot-gun after they are once joined together, as they do nearly always those of a double rifle, to make them shoot both to the same spot. Yet they can no more lay the one to shoot absolutely true by measurement than they can the other. The inch or two out of truth that some of them will shoot may look of small importance when firing at a still object; but add the deviation from accuracy to an imaginary inaccuracy of aim of ten inches or a foot, and see then whether your shots would result in kills or misses.

A really good shooting pigeon gun will, at forty yards, place, with enormous force, 230 to 250 No. 6 shot pellets in the 30-inch circle. Hardly any of them being within three inches of the circumference line, that is to say, the killing circle, will be reduced to one of a 12-inch radius. Never trust to spread to catch the bird when you are plating. In a circle such as this, you can satisfy yourself every time to an inch as to whether the gun shot true to the bullseye or not. As to selected circles, of course, you may be asked to trust to them. If you do, then forego the pastime of pigeon shooting, especially if you desire to win stakes or not to lose bets.

HOW TO COUNT THE RECORDS.

We often hear pigeon shooting spoken of as an admirable guide to the best powders as well as the best gunmakers, and judgments are nearly always formed by the number of prizes credited to the different makers. We have met this sometimes by publishing an analysis of the shooting, showing how those gunmakers who have had the most chances to win stand when the proportion of chances to win to actual wins is discovered. Very rarely have the makers whose guns have won most come out at the top of the tree under that method of analysis. It has been objected with some

show of reason that if a man has four or five guns shooting against one another, there are not four or five first prizes in the stake, and that, therefore, this is found to bring down the average when one of the four or five wins. That is so; but, on the other hand, the superior number of chances to win by reason of more shooters, should account for more stakes to the credit of the gunmaker who has many guns being used than if he had only one in. This method and these objections may be checked by counting the number of kills to misses made with any two particular makers' guns that it is wished to contrast or compare. But even that may be objected to on the ground that it is no possible test of gunmaking when some of the shooters stand at 25 yards and others at 33 yards from the traps. Any gun is good enough to kill pigeons that rise at 25 yards from the traps or even 27 yards. It is then all a question of the shooters. In order to discover how much truth there was in the objection already spoken of, we have thought it worth while, in regard to the shooting during the International week, 1897, to contrast the resulting positions given to makers of guns by the number of shots fired compared to the number of misses, on the one hand, with the position of these same makers obtained in another way; that is by the proportion of chances to win to actual wins, and in doing so we have discarded all distances below 30 yards. It will be seen that we have done this in four tables representing various distances. The first table deals with distances of 30 yards and $30\frac{1}{2}$ yards; the second, with 31 and $31\frac{1}{2}$ yards; the third, with 32 and $32\frac{1}{2}$ yards; and the fourth with 33 yards. We have placed the makers' names in the order which the proportion of shots to misses of their guns gives to them, and these positions can be readily contrasted with the wins, and also with the proportion of wins to chances. It will be observed that only once in the four tables does the winner under one head correspond with the winner under the other. After all, the prizes won, or even the proportion of prizes to chances to win, is not half so good a test of shooting as the number of kills in proportion to misses; and if this is a test of shooting,

surely it is an equally good one of guns at these distances, and when the shooting is at blue rocks.

There is a good deal of fashion in pigeon shooting, as in most other things. We can remember when the winning guns at these matches was a play on three names—Grant, Purdey, and Boss ; Boss, Grant, and Purdey ; Purdey, Grant, and Boss. When one did not win the other did. Now for some reason that we are quite unable to explain, we hardly ever see Grant's name at pigeon shooting matches. We rather fancy that it requires a good deal of energy to keep in touch with the habitual pigeon shooters. They require a very great deal to be done for them by their gun, or rather cartridge makers, and it is the last new thing, and who can get the most out of it, that serves their turn. Loading cartridges for pigeon shooting is a very different affair to loading for game shooting ; very much more care and attention is bestowed upon it, and some of the gunmakers profess to have secrets about loading that assist to bring their names before the public by the successes of their cartridges at pigeon-shooting matches.

Curiously enough the cartridge makers' names are not much reported by the Press, although the gun and powder makers always are ; yet it is he who turns out the finished article that the sportsman deals with. He cares nothing for the cartridge-case maker, the cap maker, nor the powder maker. To him ammunition means loaded cartridges, and the loader who gives him the best is the one for him. We cannot say that we think the sportsmen wrong in this. It behoves the gunmakers to know all about cartridge-case and cap makers, and to test all powders and all primers so as to insure giving the utmost velocity to the shot without undue strain upon the gun or unbearable kick upon the shoulder. If sportsmen went into all this, they would have time for nothing else, for it is a business of itself, and one that it is the duty, as well as the interest, of each gunmaker to understand thoroughly. That some of them supply cartridges greatly superior to others is a fact, although they may use precisely the same powder, the same cap and case, and similar shot.

Some results of the International week at Hurlingha and the Gun Club, 1897:—

30 AND 30½ YARDS.

Gunmakers' Names.	Chances.	Wins.	Shots.	Missed.
Westley Richards	1	0	9	1
Cogswell and Harrison.....	2	0	17	2
Woodward	3	0	11	2
Guyot.....	3	0	14	3
Lebeau	3	0	14	3
Churchill	25	2	103	24
Purley	55	3½	274	66
Holland	7	0	28	7
Bodson	3	0	12	3
Atkin	9	0	32	9
Blanchard	2	0	7	2
Greener	8	½	34	10
Powell	10	0	34	10
Lang	2	0	6	2
C. Lancaster	1	0	3	1
Braddley	1	0	3	1
Boss	6	0	14	5
Lang and Hussey.....	2	0	4	2
Reilly.....	8	0	16	10
Leeson	1	0	1	1

31 AND 31½ YARDS.

Gunmakers' Names.	Chances.	Wins.	Shots.	Missed.
Greener	1	0	6	0
Holland	3	½	15	2
Lang and Hussey.....	1	0	6	1
Churchill	13	1	46	11
Atkin	2	0	6	2
Guyot.....	1	0	3	1
Purley	13	0	37	14
Boss	1	0	2	1
Lebeau	1	0	2	1
C. Lancaster	1	0	2	1
Blanchard	1	0	2	1
Woodward.....	1	0	2	1
Powell	3	0	6	3
Cogswell and Harrison.....	1	0	2	1
Reilly.....	2	0	3	2
Westley Richards	2	0	2	2

32 AND 32½ YARDS.

Gunmakers' Names.	Chances.	Wins.	Shots.	Missed.
Greener	2	1	11	1
Churchill	19	0	60	16
Boss	5	0	18	5
Purdey	31	1	87	28
C. Lancaster	1	0	3	1
Guyot	2	0	6	2
Atkin	4	0	11	4
Holland	6	0	12	6
Reilly	2	0	8	2
Lebeau	2	0	4	2
Blanchard	1	0	2	1
Lang and Hussey	4	0	6	4
Woodward	1	0	1	1
Cogswell and Harrison	1	0	1	1
Ebrall	1	0	1	1
Dougall	1	0	1	1

33 YARDS.

Gunmakers' Names.	Chances.	Wins.	Shots.	Missed.
Purdey	3	0	24	3
Powell	3	0	12	2
Greener	4	0	17	4

We may, of course, think that a great many of these results depend upon the men who use the guns. No doubt that is true. But whether we could go as far as to say the same men using other guns would have occupied the same positions is quite another matter. What we can safely believe is that the same guns in other hands would not have come out so well. What we think is clearly obvious from these tables is that there are three ways of testing the gunmakers by the pigeon-shooting results, and that no two of them agree. The usual one of counting wins is clearly not in it with either of the others, and yet that is the only one that has for many years been relied upon by readers of the records, whatever may have been done by

those who have seen the shooting. Now that game guns are mostly cylinders or modified chokes, and pigeon guns are almost exclusively choke-bores, it goes without saying that the records of pigeon shooting are of much less value as indicative of good gunmaking for sport, than they were once. It is clear that the gun which will best kill pigeons is not the gun which will best stop driven grouse or rocketing pheasants. But the records may indicate who is at the moment the most capable man, on the principle that a man who can do one thing well can equally well do anything else. Unfortunately that does not always follow. The gunmaker who devotes his attention to sport and sportsmen cannot be always engaged in the study of pigeon shooters' form or examining pigeon guns and cartridges. He is far better employing his time.

POWDER MAKERS AND PIGEON SHOTS.

There has of late arisen a curious competition between gunpowder makers for the patronage of pigeon shots, under the false impression, as it seems to us, that what pigeon shooters use to-day game shooters will use to-morrow. We have discussed this question latterly with various powder-makers, and with gunmakers who supply pigeon shooters with their guns and cartridges, and we have heard the opinions of the competitors themselves, and we propose to set forth the views of all three classes as clearly as we are able. First of all, the powder and gun makers are very well aware that the supplying of pigeon shooters themselves is too insignificant a business to cultivate; but some of them believe that game shooters follow as a guide to themselves what the pigeon shooters do, and that, therefore, the advertisement is worth having when their powder wins prizes. We grant that there was a time when this was the case, but that was twenty to twenty-five years ago, and before powder-makers hit upon the idea of "running" pigeon shooters as their advertisement. This they practically do now; it is done in various ways, but the most favoured just now is the doubling of the prizes by certain

powder-makers when they happen to be won by the use, throughout the contest, of the particular powder made by these pushing manufacturers. In the first place this liberality is jumped at by some of the shooters, some of whom are heard to confess that there must be something wrong with the powder if such advertisement is wanted by the manufacturers of it. The obvious reply to that would be that, if the pigeon shooters really thought there was anything wrong in the powder they would be the last to use a bad article when shooting for prizes. That, however, is of the character of the all too obvious—too apparent not to have a weak place in it. No two powders made differ so much as to double or halve the chances of the shooters; yet some of the powder-makers double the former's chances for them by the simple process of doubling the prize-money when a particular powder is used. As the above remarks were written in May 1898, there may have been a change for the better since.

But it is obvious that the worst powder in the market could soon obtain the best advertisement on such lines as these, because, as most of the events are handicaps, the worse the powder a man habitually shoots with the nearer he will be put to the traps, and whether he shoots at twenty-four yards or thirty-three yards he claims the double prize on the assumption that he has influenced the public judgment by shooting with a particular gunpowder. We have an opinion that the powder-maker is making a mistake in that he does not credit shooting men with common intelligence, and he is misinformed in thinking that the average game shooter is a big fool.

For our part we thought it wise to drop reports in *Land and Water* of pigeon shooting at Hurlingham and the Gun Club years ago, when most men first discovered that they preferred not to shoot in their own names. [We are pleased to see that assumed names are now gradually dropping out again.] Of course, we make exception of the International week, which has always attracted a large number of shooters who are careless who knows what they do. If anything connected with pigeon

shooting would point to the makers of the best guns and the best powders, the International week would do it, provided gunmakers and powder-makers would leave shooters alone to choose the guns and powders they prefer. As a matter of fact this is not done, and if a man is a particularly good shot he will probably obtain both his cartridges and his guns for nothing, and pay the gunmaker and powder-maker with no thanks and less money for providing them. If there are game shots who do not know all this, we think that the time has arrived when they should do so, for it appears to us that a sport has gone very far indeed in the wrong direction when most of the best horses are nobbled and the rest are not worth getting at. There is clearly nothing dishonest in the nobbled nor in the nobblers; nevertheless, it hardly accords with British ideas of sport when men willingly handicap themselves in order to double their winnings. It savours slightly of professionalism. It is quite as unsportsmanlike as pulling a horse, and the only difference, as it seems to us, is that it is not dishonest. We cannot understand why it has been countenanced at the clubs, for assuredly their members can do without these doubled prizes.

To the game shooter the records of pigeon shooting as now carried on can be of no possible value unless he can tell what passes behind the scenes. If he happen to be a crack pigeon shooter himself he may have discovered that all the possible winnings are not publicly advertised, and when once this is discovered he will pay very little attention to the records and the prizes won as to what powder, or cartridges, or guns are used, and will not settle his own practice in imitation of pigeon shooters.

Another thing he should know is that the very men who shoot with a particular powder at pigeons frequently use something else at game.

We never thought that it was much of an advertisement for either gun or powder makers when the winners had a six or eight yards' allowance, as frequently happens in the handicap shooting; and when, in addition to shooting at distances at which it is no credit to kill, the competitors

are bribed to use a particular kind of powder, that they would not otherwise use, it only has to be publicly known to be regarded as a very costly method of advertising a bad or moderate performance.

We do not wish our remarks to be applied to pigeon shooting in the past, for it is only very lately that the objectionable practice of converting Hurlingham and the Gun Club into a powder-maker's advertisement has grown up, and we would suggest to those concerned that unless they wish to kill the credit of pigeon shooting altogether and "blow upon" their own productions, it would be wise to allow all the competitors to revert to their own normal state of free choice.

Be that as it may, we are sure that the present system cannot go on for very long. First of all, pigeon shooting, in the partial absence of shooters' names, is of no interest whatever to the public, except as a competition between gunmakers and powder-makers, and we would ask whether, when results are, like Dickon, of Jockey of Norfolk fame, both bought and sold, by doubling prizes, the Press can long go on publishing the records. It is, in fact, the Press that is the worst evildoer in the matter. Without it the abuse would not exist, for the advertisement would not be worth paying for without it was reported. The records of pigeon shooting have by process of time become a mechanical record, without any attempt at real explanation or analysis. If they were accompanied by the information as to the reasons, well known upon the ground, for using the powders and the guns of makers, we should have nothing to say, but at the present moment they are absolutely misleading as free advertisements, and as records of sport they do not exist; that is, some of the competitors take the greatest care that their names shall not appear in print. How the capital sportsmen who manage these things can have allowed such practices to grow up in the fashionable clubs we cannot say; but can only assume that the growth has been too slow and too gradual to startle them into observing to what it tends.

As these competitions take place at private clubs, it

would be easy to stop all publication of the results. That would be far preferable to the use of assumed names. The use of the latter, coupled with the cultivation of reporting in the Press, is at first sight inexplicable, but as a good many members are interested in the gun trade—and some are, we believe, proprietors of gun businesses—it becomes easier to understand why publicity should be cultivated for the guns and the powders used, and why the personal element should observe that modesty that is only equalled and rarely exceeded by the *alias*-lovers generally.

We have nothing whatever to say against pigeon shooting as such, and against pigeon shooting as it is carried on we could not say half as much as some shooters themselves say when they shoot under assumed names. If anybody should know whether it is worthy to associate their names with, it is they themselves. In making this observation we do not for a moment hint at anything that we have not said. The worst charge that can be brought against it is that it is professional, or at the very least that it is conducted on the principle of the makers' amateur by many of the shooters. We have nothing to say against the maker; nothing against the makers' amateur; but we have a good deal to say about publishing the records as guides to sportsmen without observation as to how they are got, when it is well known on the ground that men do not shoot with that which they like best, but with that which it pays best to use.

Since this article first appeared in May 1898, we have heard it has provoked some ill feeling. One member of the clubs has particularly asked why he should not shoot in an assumed name if he likes, and what business it is of ours? We are sorry to have injured anybody's feelings, and we cannot give any reason why the particular member should publish his doings to the world. As private clubs let them shut out the Press; as public events there should be no secrecy. Either of these would be equally satisfactory.

It is obviously only when the publicity given to the doings of private clubs is used to mislead the public that

we have, as a member of the Press, any right to say a word. What the member in question might do privately obviously would not interest us, or the public.

We may say that each of the powder-makers have since assured us that they do not practise the method we have condemned, but they each admit that it has been done, although not by them. Powder that is good for winning prizes at pigeon matches may be powder that spoils guns; there certainly is one such on the market; so we suggest that if game shooters follow pigeon shooters' doings they should look to the cleaning of their guns.

We understand that Lord Monson, as manager at Hurlingham, refused the public offer of doubled prizes, which was accepted at the Gun Club. He therefore did all in his power, but he could not prevent these offers being privately made and accepted.

WILD PIGEON SHOOTING.

If shooting pigeons from traps is but poor sport, the wild pigeon upon occasion gives the crack shot wonderful practice. Whether the rock pigeons are shot from boats on the sea as the birds dart out of the cliff caves, or whether the wood pigeon, when congregated in the autumn and winter, is made the subject of sport, there is, in neither case, any room for doubt about the quality of the shooting. These birds alter their direction on catching sight of the fling of the gun to the shoulder, and are therefore generally much more difficult than any driven game. The following is a description of shooting of the wood pigeon, kindly sent to us some years ago by Lord Walsingham. As we have missed many a chance of making a bag of the sort by not knowing the value of decoys when great flocks of pigeons were about, we give it for the benefit of those who knew no more than we did.

Lord Walsingham wrote as follows:—

“I have little doubt that your correspondent ‘Cymymyn’ is correct in thinking that my bag of 121 wood-pigeons, to which he alludes, is not the top score. I can well believe that it could be

largely exceeded under favourable conditions ; indeed, on looking back at old game-books, I find some of my own highest scores, as follows, beating it on two occasions :—

Year.	Date.	No. of Pigeons.	Where killed.	Circumstances.
1869	Nov. 13.	69	Narford	Among beeches.
1869	Dec. 29.	83	Holkham	Among evergreen oaks, in snow.
1883	Feb. 14.	89	Merton	Coming to feed on a clover layer.
1867	Dec. 7.	97	Merton	Over oaks, snow and wind.
1869	Dec. 1.	102	Merton	Over beeches, in a snow storm.
1887	Dec. 3.	121	Merton	Over oaks.
1870	Aug. 12.	124	Merton	Among sheaves of barley at harvest time.
1884	Jan. 28.	125	Merton	Over oaks, high wind.

“On December 3, 1887, which is the day mentioned in your paper, there was a thin layer of snow on the ground, but no snow falling and very little wind, thus two of the most favourable weather conditions for this kind of sport were absent. Moreover, having to catch a train to London, I lost nearly an hour, during which time birds might have been killed. A very large number of pigeons had arrived a few days previously to feed upon the fallen acorns in an open wood of very high oaks. Without being able to give an accurate measure of these trees, I may say that they are of nearly 200 years' growth, and I have seen no taller oaks in any part of England. Six men and boys were posted in neighbouring coverts, also frequented by pigeons, at distances varying from a quarter of a mile to two miles from the spot where I stood. They were ordered to walk about and to disturb the birds wherever more than two or three settled together. Thus the pigeons were kept all day on the move and were constantly flying over within view of my decoys: these consisted of three stuffed birds fastened by copper wire on the upper branches of a small tree which stood by itself among a group of high oaks. In addition to these, the twenty or thirty birds which first fell to the gun were set up in scattered groups on the ground in the most open places, the snow being scraped away around them to make them more conspicuous and to give them the appearance of feeding where acorns were easily accessible. The greater number of birds killed during the day were nearly half as high again as the trees, some a good deal higher; others, of course, were shot when dipping to the decoys, and on two occasions flocks of more than fifty birds chased by a falcon dashed through the branches close to my

head, each bird avoiding the twigs by a tortuous line of flight which reminded one of the waved or zigzag lines across a meteorological diagram. In these cases no bird flew straight for more than five or six yards, and the pace at which they went was no less surprising than the roaring sound made by their many wings. On both occasions I signally failed to score with my first barrel, although the bird was not more than twenty yards off. The only circumstance that gave me any considerable advantage during the day was that by putting on a white shirt over my shooting coat and a white cap on my head, I was able to stand out in the snow in an open place, having no necessity for further concealment."

PLATING GUNS FOR PIGEON SHOOTING.

"Sporting guns and gunpowder" is a reprint of reports of experiments that have previously appeared in the *Field*. We cannot say that we think gun and powder experiments of this sort are of much interest to sportsmen; but as the principles on which many of these records are based seem to be entirely wrong ones, it is necessary to point out some generally accepted fallacies for the benefit of those who are interested in getting the last ounce out of their guns, as those who take up pigeon shooting must be. The *Field* loading was rediscovered in about the year 1878. It had previously been advocated by the late Joseph Lang, and really is the only practical outcome of all the experiments recorded in the reprint from the *Field*. Lang had advanced this system in 1858.

In spite of the many costly instruments that it has required to make all these experiments—with force gauges, chronographs, recoil measures, etc., etc., it is interesting to remember that up to the year before his death the late Sir Henry Halford, an expert of the first water, preferred to make his penetration tests for powders and guns with the old-fashioned tin powder canister. Moreover, one gun-maker, Churchill, whose guns are coming to the front for pigeon shooting only less fast than his cartridges, uses no other test. We willingly grant that this would never do for a public competitive trial; but, then, who wants a public competitive trial? It will be remembered that these

events have always been remarkable for the absence of the best London makers. Now, that is not the way to hold a trial of guns. If a private individual wants to see what the gunmakers can do, there is nothing easier than to do so. For instance, some time previously to the London gun trials, at which choke-bores were first entered, we had a private trial, at which the very makers who refused entry in public, very obligingly sent guns to us with a view to selling them.

It is now generally admitted, we think, that the force gauge is not a true test ; that the chronograph is useless beyond ten yards with small shot ; and we know that the recoil test is a test of something, perhaps, but not of what the shoulder feels. This can never be measured by a spring, and one, too, that gives a constantly increasing resistance. We do not want to know what amount of push there may be, but what is the value—the negative value—of the blow one is to receive with every discharge. We cannot follow Mr. Toms, the Editor of the *Field*, in his remarks about the recoil gauge. He says :—

“ So far as our experiments have yet gone, they appear to show that the actual amount of recoil exhibited by small arms is considerably greater than that estimated from the formulæ ordinarily found in military text-books. This we attribute to the fact that such formulæ only take into consideration the weight and velocity of the body projected, and disregard any additional work that may be done in the interval between the ignition of the powder and the clearing out of the powder gases. That a considerable amount of work must be done during this interval appears obvious, when we take into consideration the frictional resistance of the shot and the force employed in expelling the column of compressed air in front of the projectile. But in big guns these items probably form much less important factors than in small arms, because the amount of air-resistance (*per square inch*) in front of a bullet or shot-charge weighing an ounce or less may be as great as in front of a projectile weighing about a ton, whereas the pressure per square inch *behind* the projectile is trifling in the sporting gun as compared with that in large ordnance.

“ At all events, it would seem that the amount of recoil exhibited by a gun bears no fixed relation to the weight and velocity of the projectile ; but that it varies with the kind of powder and shot used,

and some other conditions. There may be a certain amount of recoil, with a definite muzzle velocity, on firing a spherical ball from a smooth-bore with 3drs. of powder; and on firing a similar charge of powder, from the same gun, with a charge of small shot of the same weight as the bullet, the increased friction in the barrel may greatly reduce the muzzle velocity of the shot, yet leave the recoil very little altered, or occasionally the recoil may even show an increase, as in some of the instances here recorded. Again, when a barrel is foul, the velocity of the projectile is greatly diminished, but the amount of recoil is not diminished in the same ratio. Thus, the doctrine that 'action and reaction are equal and opposite' does not appear to work satisfactorily when taken in the restricted sense in which it has often been applied in the formulæ of military text-books.

"If action and reaction can be relied upon for estimating the recoil of the gun from the muzzle velocity of the shot, it should likewise be applicable to the converse process of estimating muzzle velocity from the amount of recoil. But, on adopting such a course, we find that the estimated muzzle velocity stands hundreds of feet higher than the actual speed which the chronograph records. We, therefore, conclude that the speed of the projectile merely indicates the *effective work* performed by the powder in imparting energy to the shot: *whereas recoil is a representation of the total work performed in the gun*—that is to say, it includes the *non-effective work* performed in overcoming frictional and other resistances, as well as the energy transferred to the projectile: and in some instances the non-effective portion appears to be the larger of the two."

This reprint occurs in 1897, whereas on 18th March, 1899, we find the following contradictory authoritative Editorial opinion expressed in the *Field*:—

"Any obstruction at the muzzle to the passage of the projectile tends to drag the barrel forward, and therefore to lessen the recoil."

Thus we have it implied that fouling tends to diminish recoil, and asserted that any obstruction at the muzzle also does so. Both propositions are contradicted by the italicised portions of the above quotation.

Mr. Toms makes the recoil of a 7lb. gun 35 ft.-pounds, whereas the energy of an ounce of shot travelling at a muzzle velocity of 1,200 ft.-seconds is 1,400 ft.-pounds roughly. How he can, without taking the velocity of recoil, convert his 35 pounds of weighed recoil into "foot-

pounds" to compare with a velocity record, we cannot conceive. It seems clear that he has omitted to take into consideration that the formula $\frac{w \times v^2}{2g}$ is a record of time as well as work done. It is impossible to get an answer in foot-pounds out of a pair of scales for measuring dead weight, and yet this is the equivalent of Mr. Toms' measure of recoil in, as he supposes, "foot-pounds."

PADS OR CHRONOGRAPH.

We believe that the chronograph has a value for the powder-maker, but we doubt its value as a test for the finished article—the cartridge. In order to support our assertion that country gunmakers and sportsmen require none of these costly instruments, we will explain a few of the faults that never have been overcome in the chronograph as a test for shot-gun cartridges. The most experienced users of the chronograph now test their powders at ten mètres distance from the muzzle of the gun, and this is the furthest-away distance that is at all reliable. At this distance it does not matter whether the shot ball, or not, very much, for balled shot would not necessarily be there before the rest of the load. The shot are all very near together, and "stringing" makes but little difference between the first shot and the last at that distance. But it is admitted that the chronograph is of little or no use at forty yards; first, because two shots sticking together, when there are any, travel faster than single shot, and give the record; second, because when there is stringing of the shot, one after the other, as in wild shots, no knowledge of it is given by the chronograph, and it is the first shot that gives the record. There is not, in practice, any means of dividing pattern and penetration one from the other. The shooter wants both, and the game must have both if it is to die that sudden death that the true sportsman loves to see. But the chronograph does divide pattern and penetration. It is the slow igniting powders that give the patterns, according to one of the most celebrated of gun-makers who ever lived. Besides this we can confirm it by

our experience at another crack maker's, for when trying Mr. Holland's cylinder gun, previously reported in *Land and Water*, it was E.C. that gave an average pattern of 160 No. 6 shot in the 30-inch circle—the highest cylinder pattern ever recorded with $1\frac{1}{8}$ oz. of shot. But it is not the slow igniting powders that will give the best chronograph results at ten mètres, and yet they will give the penetration pads a wonderful doing at forty yards. The fact is that you must have quick ignition to please the chronograph, and slow ignition for pattern and penetration, without balling, at forty yards.

For the purpose of test, therefore, we much prefer Pettitt's pads to the chronograph, but used as we used them twenty-three years ago, when we tested Mr. Greener's first choke-bore against our own cylinder. Then it was the fashion to use a 45-sheet pad, and count the number of sheets pierced by a single shot, and call that the penetration of the gun. That was absurd, for it had the fault of the chronograph, and a couple of shot stuck together would advance the record and destroy its truth. We used 20-sheet pads and counted as the penetration of the shot the proportion of pellets through, to those that struck the pad. We advise every gunmaker to do the same. The pads are less than half the cost to start with, and the record is that of the average of the pellets, instead of being that of one shot pellet. But this is not all of the methods within the country gunmaker's reach for testing penetration, or, if you like, "energy." No instrument is of the least use for the testing of recoil. There are instruments that will give some record of recoil, but this has very little to do with "kick," and that is what we want to know about. Total energy, as the inventors of these instruments understand it, may be represented by a pleasant prolonged push. If so, there is no "kick" at all. "Kick" is something sudden and violent, it is always present when quick powders are used, and these as a rule are not productive of much "energy" in recoil, as measured by the machines. The *Field* has abandoned its "force gauge" or its spring measure of the force of the shot after much outside persuasion, and it has now put the spring

behind the gun to take recoil. We think that as bad as we always held the other to be.

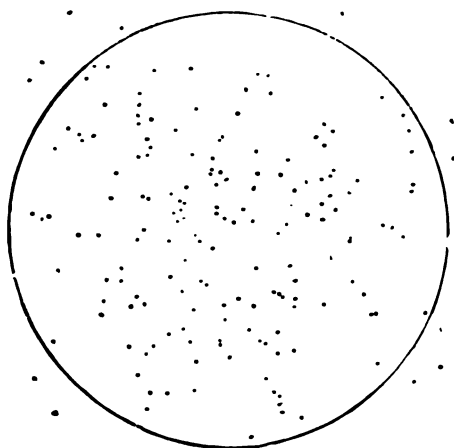
GUN PATTERNS.

We have always thought that Mr. Greener leans too much to a reliance upon the selected circle in testing shot-guns. What he says about it is that any variation from the centre is the fault of the shooter, and not of the gun. But against this we might point out that a rifle that was offered for sale by a gunmaker on that principle would not readily find a purchaser. A rifle-maker is obliged to show that his weapon will repeat its shooting into the bullseye time after time. If there is any difficulty in aiming accurately at the target with the shot-gun, we should say that it is either the fault of the gun or the clumsiness of the construction of the rib and false breech which prevent the shooter from knowing exactly where he is shooting. We have dealt with this subject in another place, but Mr. Greener's book necessitates a few remarks.

Mr. Greener records some useful experiments on the patterns of various guns and charges. Nobody (with the exception, perhaps, of Mr. Griffith, of the Schultze Powder Company) has experimented as much for pattern as the author of "*The Gun and its Development*." He says:—

"At forty yards from the muzzle of a gun it has been proved that on frequent occasions a few pellets of the charge will be found ten, fifteen, and even twenty yards from the centre of the body of the charge: thus, at forty yards a gun may, whilst putting the greater number of its pellets into a 30-inch circle, scatter some forty yards asunder.

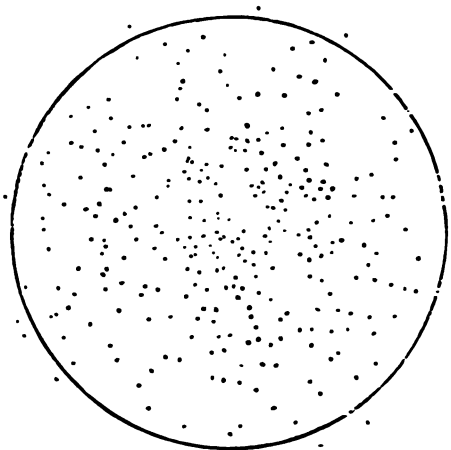
"The following facsimile reproduction of targets made by the author will enable the sportsman to see at a glance the comparative density of patterns, and the approximate killing spread of the gun. These targets, obtained with guns of different gauges, may be approximated by guns of any gauge by altering the load or the range, or both.



No. 1.—30-IN. CIRCLE.

"No. 1.—Number of pellets in circle, 163. Killing circle, about 26in. Diagram representing the shooting of a 28-bore gun, full choked, at 40 yards, with $1\frac{1}{2}$ dram of powder and $\frac{3}{4}$ oz. No. 7 shot.

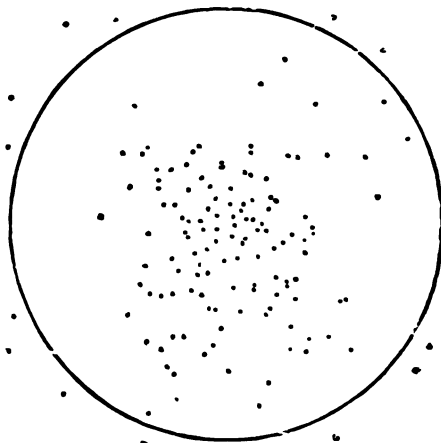
"A similar pattern would be made with a 20-bore and 1oz. No. 6 shot, or a 20-bore with $1\frac{1}{2}$ oz. No. 5 should be no closer, but a killing circle two inches larger.



No. 2.—30-IN. CIRCLE.

"No. 2.—Number of pellets in circle, 285. Killing circle 30in. This diagram represents the shooting of a 28-bore cylinder gun, at 20 yards, with $1\frac{1}{2}$ dram and $\frac{3}{4}$ oz. No. 7 shot.

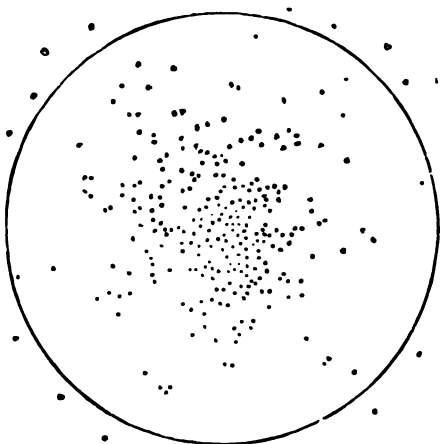
"A similar result is obtainable from a 20-bore cylinder with $\frac{3}{4}$ oz. No. 8 shot.



No. 3.—30-IN. CIRCLE.

"No. 3.—Number of pellets in circle, 131. Killing circle about 18in. This diagram represents the shooting of a 28-bore gun, choke-bored, at 20 yards distance; charge, $1\frac{1}{2}$ dram and $\frac{3}{4}$ oz. of No. 6.

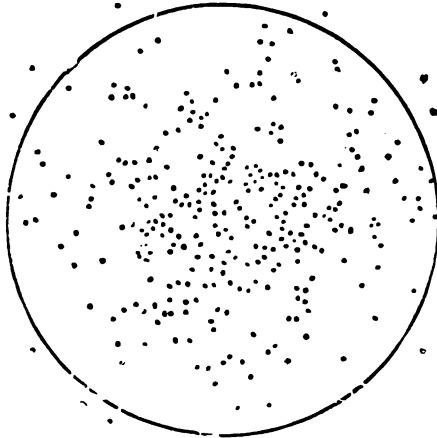
"A similar pattern results from using a 20-bore with 1oz. No. 5 shot at 18 yards; with $\frac{3}{4}$ oz. No. 6. A 20-bore at 20 yards makes a killing circle about two inches larger.



No. 4.—30-IN. CIRCLE.

"No. 4.—Number of pellets in circle, 292. Killing circle, about 25in. This diagram represents the shooting of a 12-bore gun, choke-bored; distance, 20 yards; charge 3 drams and $1\frac{1}{8}$ oz. No. 6 shot.

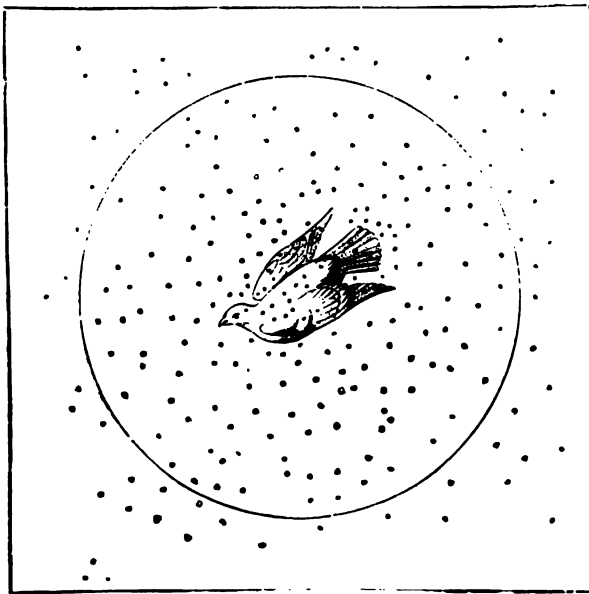
"A similar pattern results with a 20-bore at 20 yards with 1oz. No. 8 shot, but with the 20-bore the killing circle is a little less.



No. 5.—30-IN. CIRCLE.

No. 5.—Number of pellets in circle, 288. Killing circle, 30in. This diagram represents the shooting of 12-bore cylinder gun at 20 yards: charge 3 drams and $1\frac{1}{2}$ oz. No. 6.

The same result is obtainable from a choke at 20 yards, by using 1oz. No. 6 and *scatter charge*, or by using a brass case gun at 40 yards with $1\frac{1}{2}$ oz. No. 7, or with $1\frac{1}{2}$ oz. No. 8 at 40 yards.

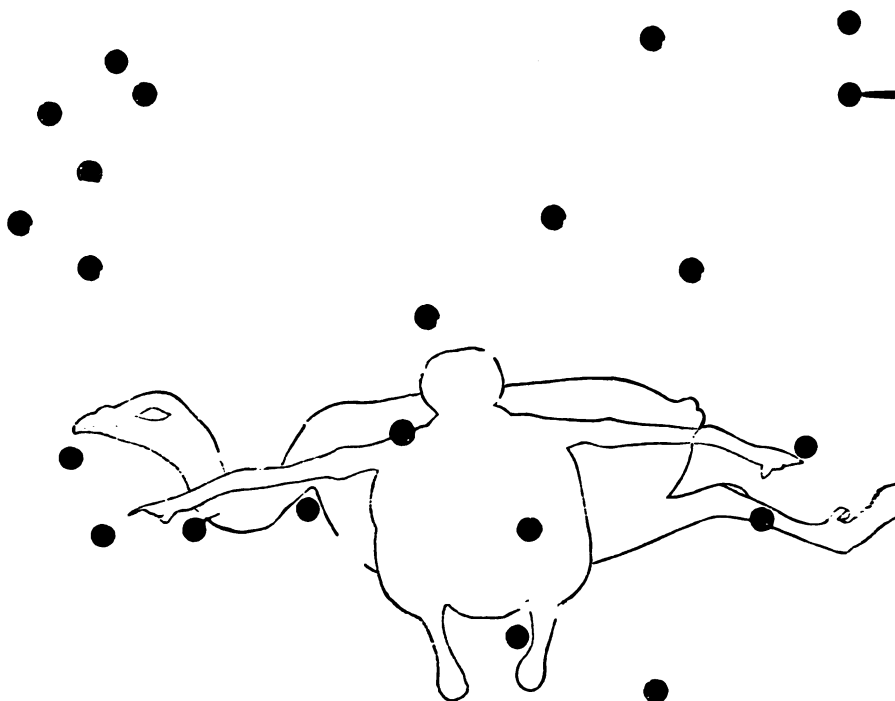


No. 6.—30-IN. CIRCLE.

No. 6.—Number of pellets in circle, 250. Killing circle, about 35in. This diagram represents the shooting of a pigeon gun, 12-bore, with 4 drams and $1\frac{1}{2}$ oz. No. 6 shot.

"The illustration shows the pattern of a 12-bore choke gun upon a pigeon: the rough outlines of the bird's body (exact size) flying crosswise, to and away from, the shooter, were sketched in the centre of a large sheet before shooting, and the illustration is an exact reproduction of the resulting target.

[We cannot see how Mr. Greener reconciles facsimile No. 6 with his reduced facsimile of the pattern of a choke upon a pigeon, except that the latter is selected for its badness and the former for its merit.]



REDUCED FACSIMILE OF A CHOKE UPON A PIGEON.

"The author has known as many as six successive shots to have been fired from a cylinder 12-bore gun at a stationary pigeon without it being killed, the distance only 35 yards, the charge and load a full one, and, as shown on the target, the pigeon well in the centre of the pellets' flight each time. After the sixth shot the bird was examined and found to have been struck by nine pellets only.

"On the other hand, the cylinder gun put 54 pellets into a pigeon at 15 yards' range, and at 20 yards the choke averaged but forty.

"The small-bore gun will kill as well as the larger bore, provided the pattern be as close, but when the bird struck is not in the centre

of the pellets it is not always killed. A pigeon placed in a wooden box six by seven inches, with its broadside to the gun and a piece of thin paper only between the bird and the gun, was fired at with a 28-bore gun, with the following results at different ranges:—

	Pattern		
	Charge.	on 7 by 6.	Result.
No. 1 Pigeon, 40 yards	1½ dram.	13	Birds struck in body, but not in any way disabled.
	¾ oz., No. 6		
No. 2 Pigeon, 40 yards	1¾ dram.	12	Leg broken; one pellet in breast, not disabled from flying.
	¾ oz., No. 6		
No. 3 Pigeon, 35 yards	1 dram.	18	Shot in body, but not disabled.
	¾ oz., No. 6		
No. 4 Pigeon, 35 yards	1½ dram.	18	Shot in body, but not disabled.
	¾ oz., No. 6		
No. 5 Pigeon, 30 yards	1½ dram.	23	Killed dead.
	¾ oz., No. 6		
No. 6 Pigeon, 30 yards	1 dram.	35	Killed dead.
	¾ oz., No. 6		

“A study of these results and the loads used reveals the truth of the assertion the author has so many times made as to the relative values of pattern and penetration: 1 dram and ¼ oz. of No. 6 gives a denser pattern than when 1½ dram is used, and kills the bird equally well: but in all cases where the pattern was not dense enough to strike the bird in several places, although the penetration and velocity were great, the bird was not killed.

“As to the amount of penetration, striking force, or velocity requisite to kill, experiments were made at the Chicago Gun Trial in 1879 to determine what penetration of straw-boards was equal to penetration of a pigeon: when it was agreed that any force strong enough to pierce twelve to fourteen sheets of straw-board was sufficient to kill such birds as pigeons and ducks. It remains only to remark that large-sized shot is more deadly: shot of 270 to the ounce penetrated and proved deadly in birds which shot of 375 to the ounce at the same velocity failed to kill. A penetration of seven straw-boards entered the body of a duck.

“The reason feathers are knocked out of birds is not because the gun lacks penetration power, for the pellets, striking the birds at an oblique angle, cut, injure, and root out the feathers; the bird escapes because the pattern is not close enough to ensure at least one pellet striking a vital part.”

We are very glad that the author of “The Gun and its Development” condemns the instruments that have been

invented for testing shot-guns. He says that, as to recoil he has often known the guns and loads that gave the highest records on the instrument give the lightest blow on the shoulder. This, coming from the man who has won most fame under the *Field's* systems of test, is not to be gainsaid. We may say that we have always been of opinion that neither penetration nor recoil could be measured by spring. What we want to know is not what amount of push (that is power exerted over distance) recoil is capable of giving; it really does not affect the shooter; but a blow is quite another matter. What we want to know is not therefore, the distance a gun will travel backwards (great with equivalent charges of No. 6 than with No. 2 black) but the pace it travels at for the first half inch or inch of its progress (faster with No. 2 than with No. 6 black).

The difference of feel to the shooter is caused by the No. 6 beginning slowly and gradually seating the stock firmly on the shoulder. With charges giving equivalent velocities, No. 6 powder will always register highest on a machine; that is, one in which distance backward of recoil has anything to do with the record; but the exact opposite is the case when the shoulder has to do its own measuring. Other circumstances being alike, a rapid-burning powder always kicks more than a slow one, and a light gun more than a heavy one. Neither of these facts are invariably shown on the instruments for measuring recoil. They profess to measure only the energy; and the energy is increased by the weight of the gun, whereas true "kick" is taken up and lessened by the weight of the gun. So far we entirely endorse Mr. Greener's views about these instruments. In fact, we condemned them ten years before he did so.

CHAPTER XIII.

GAME SHOOTING.

THE number of kills to cartridges is very little guide to a shooter's true form: yet the old comparisons are revived again and again, always to the disadvantage of those who might, with equal logic, and respect for "ould Ireland," be called our "degenerate ancestors." A late implied attack on the "degenerate ancestor" is that of Rapier in the Notes of *Badminton Magazine* for December, 1898—a capital magazine—but even if the more odious in consequence, we prefer comparisons to be comparative.

Here are the paragraphs to which the "degenerate ancestor" might rightly object:—

"In an old number of the *Sporting Magazine*, dated 1824, I find an account of a match shot between Lord Kennedy and Mr. William Coke: and it strikes me as interesting from the comparison afforded of what was considered good sport early in the century and is considered so now, near as we are to the end of it. Birds lay better, we may be sure, for the country was wilder: there were fewer enclosures, there was less drainage, and infinitely more cover for birds before scientific farming came into vogue. On the other hand, the 'fowling-piece' has vastly improved, though skilful shooters make very pretty practice with their clumsy old guns, as we learn from the authentic records of Colonel Hawker and others. As for the match in question, it would seem that Lord Kennedy and Mr. Coke had been vaunting the sport to be obtained, the first in Scotland, the second in Norfolk. They agreed, therefore, both to go out, first on September 26, secondly on October 4, Lord Kennedy on his own estates, Mr. Coke on his uncle's manors near Holkham: each was to be accompanied by a couple of umpires, representing his opponent, and whoever killed most partridges won the wager.

"Mr. Coke set out early, with several keepers, the umpires—who of course, did not assist—and a dog; also his uncle, who loaded for him on occasions. It was very foggy, and the turnips were so wet

that the birds would not lie in them : but in the course of a couple of hours, about eight, the weather cleared, and the day became fine. The sportsman killed $86\frac{1}{2}$ brace and five pheasants, which latter, however, did not count. On the next day—October 4, that is—he got 88 brace but there was a dispute, the nature of which is not stated, about one bird, so that only $87\frac{1}{2}$ were counted ; that makes 173 brace in all. On the second day Mr. Coke shot better than on the first, firing many fewer shots. He killed—this is a point for comparison with to-day—180 birds in 327 shots. I suppose the odd five were more pheasant for $87\frac{1}{2}$ brace means 175 birds. Lord Kennedy did considerably worse. He got 50 brace the first day, 82 the second, or 132 brace all, and was thus decisively beaten by $42\frac{1}{2}$ brace. How many shots he fired is not stated. Mr. Coke, on the second day, hit oftener than he missed, it will be seen, for with a half-and-half proportion 327 charges would have meant 163 birds, and he accounted for 17 more ; but one suspects that the partridges were not nearly so hard to approach as they are to-day, and rising out of roots and thick stubble would not, as a rule, take much shooting. What, I wonder, would have been Mr. Coke's proportion of kills to cartridges with driven birds ?

“ No doubt the pair of them were convinced that they had done an amazing amount of shooting, and their friends agreed with them. Mr. Coke's uncle, it will be seen, helped him to load—and the younger generation of sportsmen do not realise what a tedious business that was. I have a vague recollection of an old muzzle-loader that I used as a boy for want of a better, and loading *was* a ceremony ! Think of it ! You inverted your powder-flask and poured the measure down the barrel ; then you felt in your pocket for a wad, drew the ramrod, and stuck the little round of stuff into the barrel, thrusting it down till the ramrod bounced when flung down against the wad ; then you measured your shot in the shot-flask, poured it in ; another wad, another thrust, another bounce ; and then you felt in another pocket for a cap—often dropped it on the ground if your fingers were cold or your gloves clumsy ; and at last you were loaded. In my boyish enthusiasm I would gladly have spent an hour over the operation for the sake of a shot, had it been necessary ; but it was a joy, none the less, to get hold of a pintfire gun. Very likely many readers of these ‘ Notes ’ have never seen one, and do not know that a little brass pin projected vertically from the base of the cartridge, and fitted into a little hole at the base of the barrel. It seemed that finality was absolutely reached in the way of rapidity and convenience ; but then came central fire, so infinitely more convenient still. Is any further advance possible, I wonder ? I wonder, also, what Mr. Coke and Lord Kennedy would have said if they had been told that some day

a sportsman (Lord Walsingham) would fire 1,510 cartridges and kill 1,058 grouse in a single day? Assuredly they would have thought the idea very mad indeed, and utterly beyond the bounds of possibility."

What Rapier forgets is the great number of dead and wounded birds that were not picked up. For instance, it was stated at the time that Lord Kennedy had killed about 120 brace on the second day. Part of the rules of this match were that it was unnecessary to pick up the birds; and provided the umpire saw them fall, that was enough, they counted. This rule led to shooting at very wild birds, and the result was that one or both the shooters declared this competition shooting to be cruelty to the game, and that they would never again indulge in such matches. Is it not easy to see that the whole difficulty experienced was the distance at which birds rose from the guns? In driving game distance counts for much less.

When match shooting was not in view, the "degenerate ancestor" could do really wonderful work with his gun. Moreover, this Mr. William Coke should not be compared as a best representative shot of his day with best representative shots of our own day. On another occasion he made a match with Captain Horatio Ross at Holkham, and was well beaten. Yet he knew his ground well, and was shooting over his own dogs. Captain Ross, on the contrary, was told by one of the farmers who were looking on, that he was a perfect child at beating for Norfolk partridges. He had, moreover, borrowed dogs to work with. On the first day these chased the game out of the fields and followed full cry, and on the next day of the match his brace of borrowed setters had but two eyes between them. Captain Ross had a record of 86 grouse in 89 shots, and his pigeon-shooting record was about as good, so that, on the lines of comparison laid down by Rapier, no driving shot of to-day is within streets of him. Yet, as we have indicated above, comparisons of this kind are not truly comparative.

Lord Malmesbury killed 38,475 head of game in 3,645 days out; for this he walked 36,200 miles, and the total misses were 16,766. That is 2·3 kills to one miss;

but, then, circumstances alter cases, and there is a record that Sir Charles Ross's puntsman killed 147 birds in a single shot with the punt gun, and this 147 to 1 beats everything in the proportion of cartridges to kills, and the difference between the punt gun and the double 12-bore shot-gun is hardly greater than the difference between game getting wild and flying away from the shooter, and game getting equally wild and flying at him. The two comparisons are equally, and only equally, unfair and misleading.

The average will always be in favour of the man who picks his shots, and, to compare big things with small, we suppose that the greatest picker of shot is, and rightly is, the puntsman. Next, perhaps, would come the man who backed himself to kill thirty snipe with thirty charges of shot, and succeeded. He missed a bird, but when this had happened he reduced his loads and continued to shoot, so that although he did not get thirty birds in thirty shots, he won his match. This was the late Mr. Thomas Beatty, of Borodale, for forty years Master of the Wexford Foxhounds. A snipe has the greatest character of any bird for getting out of the way of the shot, but he lends himself to the picking of shots, perhaps, more than any other. First, he is a totally different bird upon different days, also in different seasons of the year, and, moreover, he is so much easier to shoot when there is a fair wind blowing and the careful shooter walks down wind, than he is when the same shooter upon the same day walks up wind. That is to say, the snipe that rises up wind of the shooter flies into the wind and continues his course away from him, but the snipe raised down wind is bound to come round and meet it. The former, if he gets up thirty-five or forty yards away, is almost as safe as Mr. Winkle's partridges: the latter rising the same distance off (which he will not do as a rule), is by no means safe from a moderate shot. A good average of kills for cartridges does not proclaim the greatest shot, even at snipe, and when comparisons are made between two or more different averages at various kinds of game, the results arrived at may be, and generally are, of no value whatever. Some years ago we were asked to look over some shooting

proofs for a book on shooting; we will not mention names, but the following may amuse our readers as much as it did us: ". . . bagged in single shots, without a miss, 58 grouse and a hare." That may very well have been so, but then the writer, not satisfied with such company, in the self-same page began a paragraph: "The best man I ever shot in company with was . . ." (somebody else), whom he had seen shoot for forty years, and never recollected seeing him shoot and not kill. We really think that this man, John Brady by name, should be selected as the champion picker of shots, bearing favourable comparison with the punt gunner in that respect. When we come to consider the ethics of sport there is something to be said for a man who shoots forty years and never wounds a bird or a beast. Perhaps there is less to be said for the man who records such an impossibility.

Shooting without missing was an ideal with the "degenerate ancestor," that is to say, when he was not killing numbers for a wager, and even the driving shot of to-day does not know how much clean killing has tended to make driving game as fashionable as it is. In driving, for some reason or another, the game is generally killed or missed. It is not wounded very often. Probably the reason is because the shooter and not the bird selects the distance and the angle at which to shoot: the vital parts are a good deal more exposed in this kind of shooting than they are when the bird is going away; but the greatest difference of all is in the difference of energy of the shot pellets, when meeting or when catching up the game. If, for instance, we say that there is a remaining velocity in the shot pellets of 500 feet per second when they catch up a going away bird, and that the latter is travelling at 100 feet a second, then the striking velocity is reduced to 400 feet per second. Whereas if the bird is meeting the shot pellets at exactly the same pace for both shot pellets and on-coming bird, then the velocity at which they enter is increased to 600 feet per second. This difference between 400 and 600 does not represent nearly the difference of the energy of the shot on striking: this increases as the square

of the velocity. Thus the two different energies of the striking pellets, travelling exactly the same pace, would be represented by the comparative figures 16 and 36, or 4 and 9. So that the difference of direction of the flight, away and to the shooter, assists or diminishes the power of the gun by more than double.

Some young shots who love to turn round after the passing grouse, that are so much easier killed in front, will perhaps remember these calculations and how they are "straining their guns" when calling upon them to do so much more than is necessary. In order to simplify, we have taken round numbers in all cases in the above calculation, but if the velocity for a bird that gets up in front of the gun is too high at slightly over sixty miles an hour, the pace of the bird coming at the shooter, with a wind behind it, often greatly exceeds this. And although No. 4 shot will, at forty-five yards, retain a speed in excess of 500 feet per second, No. 6 will not. It does not matter, in reason, how the shots are varied between No. 6 and No. 4, or the distance from the game, between thirty-five and fifty yards. the difference of energy of the striking shot will remain about one-half for the going-away bird.

Can it be wondered at that sportsmen, who, when they deserve the name, hate cruelty as much as they do bungling, prefer driven game? Is it to be wondered at that the clean work at the rocketeer is somewhat erroneously attributed to the head and neck alone getting shot when the shot pellets strike a blow equal to that of double their number on retreating game. The "degenerate ancestor" was as good a man at fighting wildfowl as can be found now. Yet we have one of the great supporters of the difficulty of the "driving" shot recording with approval the opinion of Captain Gould, of wild-fowling fame, that he has measured the flight of teal against the wind at a mile in twenty seconds: and again, the slowest record, a mile in twenty-five seconds, also against the wind. This twenty seconds' record is equal to 180 miles an hour. It is perhaps worth while to see how the energy of shot would be varied by the going-away bird and the coming one at these paces. The rate of flight

would be 264 feet per second. Thus the 500 feet per second of shot would be reduced to a striking rate of 234 feet per second for the going-away bird, and increased to 764 feet per second, entering velocity, for the bird meeting the shot. But the proportionate energies of these two velocities are remarkable, and not merely three times as great in accordance with the striking velocities. The 234 feet per second is represented in energy of shot by the comparative figure 5.5, whereas the 764 f.s. is represented by a comparative energy figure of 58.2, or more than ten times as great. In shooting duck we have, however, found that shot can glance off their feathers in a remarkable way, and certainly more than usual when they come straight at the shooter.

This glancing of shot is a very difficult thing indeed to prove. A shooter may be morally certain that he was dead on a coming duck, for which he had to make no allowance whatever (as is the case when the flight is dead level, straight at the shooter's head), and yet the bird may not, to all appearances, be touched. We have experienced this more than once, and we could never understand how it could happen until one day we had an experience of glancing shot on a human leg. The leg was hit hard enough by two pellets for one to bury itself completely and the other to travel round under the skin from the front of the leg to the back without ever going deeper than the skin anywhere. Thus it made the half of a circle, and travelled about eight inches in that way.

The added power of the blow lent by the meeting forces is somewhat handicapped by the greater allowance necessary for angular shots. That we have before attempted to deal with, and our object is served now if we have shown that comparisons between the two systems of shooting the old and the new are out of the question, and misleading when made.

VARIOUS OPINIONS ON AVERAGES OF KILLS TO CARTRIDGES.

Mr. Alfred Watson—"Rapier"—who has frequently discussed this question, once sounded some well-known shooters upon their views of the average of kills to

cartridges fired at game. Of course, the principal answers are objections to the principle of the question. They do not agree upon two most important points: first, what distances away game should be fired at; second, whether the object is to kill the most game, or to kill it in the best style. How, then, is it possible for them to agree upon what proportion of kills to fired cartridges should be accomplished by a good shot. Let us take one instance. Lord Walsingham thinks that:—

“One man may be a good shot in the sense of killing a larger percentage: another may be a better shot in the sense of getting his gun off more frequently. Although missing a larger percentage, the latter may kill far more game. . . . A slow picker may bag six out of ten on a calm day, and a quick looser may get four out of ten in a gale, which would bring the picker down to two. Sixty in a hundred is good shooting throughout any day, but thirty is nearer the mark with most good shots, if you take the season through, allowing for a fair proportion of wild game.”

His opinion, that if a shooter kills thirty out of a hundred he is still a good shot, will hardly be endorsed by any of those good shots who confine their attention to game within forty yards as we are all constantly being told that we should do. But as we know that Lord Walsingham does loose off up to eighty yards or so, upon occasion, with good effect too, we cannot wonder at his views that thirty kills to a hundred shots constitute good shooting upon occasion.

Mr. A. Stuart-Wortley says about it:

“Three kills out of five cartridges is *very good indeed*. Half-and-half is much above the average, and means very good shooting. Two out of five is quite respectable. This means over an average of days and at varieties of game, including rabbits. Of course at pheasants only (when not high) the average should be a little better all round.”

“The Hon. John Scott-Montague writes: ‘The relation of kills to cartridges depends chiefly upon two factors—the class of shooting and the class of shot. Very easy pheasants at a moderate height, and other kinds of easy shooting, conduce to an excellent average: but, again, when pheasants come down wind, over very high trees or over a valley, the finest shots will have their average greatly reduced. Again, what would be a good average in partridge-driving late in the season would not be a good average, as a rule, covert-shooting. As

o the second factor—the class of shot—this has even more to do with the question than the kind of shooting. There are some men who hardly ever try a difficult, or even a long, shot. They are content to take comparatively easy shots, and kill with more or less certainty. On the other hand, there are some men who shoot extremely quickly, and who, in the course of the day, though even, possibly, not quite so good shots as those to which reference has just been made, will yet kill a good deal more. This is especially the case with rabbits, where shooting quickly in covert must result in not so good an average as if only shots in the open or crossing a ride were taken. Also with wood-pigeons and wildfowl: both of these can be killed at long distances with fairly heavy charges, and in the case of wood-pigeons specially, if a man only fires at comparatively easy and close shots, he will not, as a rule, have obtained many of these wily birds by the end of the day, whether he is shooting them coming into roost in a wood in the evening or to decoys in the daytime. I should be inclined to say that the proportion of kills to cartridges is, as a rule, no real test, taking general shooting, of a sportsman's skill. Anybody can improve his average by only taking shots which are easy, and not shooting at anything he is likely to miss. However, the quick shot will be found to add far the most to the bag, and, if he does not fire at habitually long ranges, will, in proportion to shots fired, do no more harm to the stock left than the man who is a slow shooter. The quick shooter, who does not dwell on the object fired at, is, as a rule, also the safer shot of the two.

“Lord Granby writes: ‘When you ask me my opinion as to what should be the proper proportion of “kills to cartridges” for an average shot, you propound an almost impossible question: for nothing is so fatal to good shooting as the idea of making a “fine average.” It demoralises the moderate shot, and induces him to poke about with his gun, while many birds at which he *ought* to fire are not shot at all. The young gunner ought to shoot at everything which he considers *fairly* within range, and not bother his head about “picking his shots” and counting his cartridges. If he *does* begin this, he will never become a sportsman in the proper sense of the word, though he may turn out a good shot by accident. Moreover, a man may find himself for an entire day's shooting in places where birds come high, curly, and slanting-wise; whereas on another day he may be favoured continuously with comparatively easy shots. In diverse circumstances such as these it is impossible to strike an average with any success.’”

There is nothing to be added to these opinions except to re-assert, if need be, that you cannot compare Lombard

Street with a china orange. Whether the man who shoots only at such birds as he can kill is the best man, or whether superiority lies with him who gets off the greatest number of well-directed shots, careless of distance, and careless of his chance of wounding, is the best man, we are not prepared to decide. The first was the fashion during the first half of the century, whereas the latter is, we hope not too much, the fashion at present. It may be objected that the man who gets off his gun most often is necessarily he who wounds most. In practice there is not much doubt that he who takes the most difficult shots also takes the long ones. Quick shooting has come to mean something entirely different to that which it once did. It used to mean getting quickly off at the object of aim; now it means getting the gun off a great many times at different objects of aim in a short space of time. Taking difficult shots no doubt means a greater number per cent. of wounded birds; and it does not matter whether the difficulty consists in distance or in angle and speed, the result must be the same. Nevertheless, as Lord Granby says, it is hard to discover how a shooter is to become first-rate unless he does take the difficult shots.

In an old number of the *Sporting Magazine*, dated 1821, there is recorded a much better average at the Earl of Bridgewater's. Here are the figures:—

First day, 7 guns	...	627 shots	...	326 killed.
Second day, 9 guns	...	956	„	511
Third day, 8 guns	...	388	„	261

That is altogether 1,098 head of game falling to 1,971 shots. The best shots were the Duke of York, the Duke of Wellington, the Marquess of Londonderry, Lord Bridgewater and Lord Verulam. The Duke of Wellington's double-barrelled gun brought down everything before it.

It was not until long after 1821 that the first attention was made to make the shooting of pheasants difficult for guns, and although the above record is no doubt very frequently beaten now, yet comparisons are obviously difficult to make when the object of one beat is to kill every

possible, and that of another is to make all the shooting as difficult as may be.

It will be seen that the 1,058 grouse killed by Lord Walsingham in a day required 1,510 cartridges. The average of two out of three has, it is said, been accomplished by the Duchess of Bedford, during the season 1897-98, who fired 3,325 cartridges. This excellent performance would be very greatly above the average in covert unless it was so arranged that most of the shooting took place outside and in very wide rides. We hear that Her Grace is a first-rate shot at rocketers when she can see her birds coming from a fair distance in front.

PHEASANTS AND SPORTSMEN.

One of the most curious features about covert shooting is that everybody who has never tried it abuses it, and nobody who has experience of it has much to say against it.

We have often received letters protesting against the modern newspaper critic generally. We have not published them, for we have asked the writers where such writing is to be found as that which the late Mr. Bromley-Davenport described so amusingly, and exaggerated just enough for his purpose. The man who loves to go out and find "the rocketeer in his lair" we have never quite come across, either in newspapers or in real life. He does not exist as he is painted, and we have gone as far as to hint that sportsmen love to set him up, like an Aunt Sally, on purpose to have cock-shies at him, and knock him down again. We grant that the sporting magazine writer and the daily paper stop-gap usually know very little about the game; but they, nevertheless, are usually well enough acquainted with their own want of knowledge to avoid showing the deficiency. We have of late years gone further, and while not denying that inexperienced critics of the "battue" were once as plentiful as blackberries in October, we have asserted that the race had disappeared.

We are now constrained to withdraw some portion of our somewhat premature assertion. Mr. Watson, editor

of the *Badminton Magazine*, has discovered a modern critic of the "battue"; but he has had to search for her, and find her, in petticoats. "Ouida" is the offending genius, and she writes to the magazine in question as follows:—

"In 'The Massarenes' there are many direct attacks against sports. I do not think any are unjustified by fact. The thousands and tens of thousands of heads of game slaughtered in the shooting season are for the most part sent (*i.e.*, sold) to the markets. If a visitor does not kill his due quota of game at these big 'shoots' he is despised by his host and his fellow-guests. If you know anything of battue-shooting, you must be aware that the majority of the pheasants shot *are* 'tame home-fed birds'—birds reared solely for the purpose of being shot: about such birds there is nothing wild whatever: to their last day they crowd round the keeper to be fed. In one well-known estate in England, where the great extent of the coverts and height of the trees favour the flight of the birds, wooden stands are erected in the drives, from which elevated position the gunners can hit the pheasants more securely. It is not I who invent the enormous numbers of winged creatures slaughtered in one of your shooting-seasons; they are proudly put on record, and cannot be either exaggerated or denied. There *is* not a single honourable or even respectable feeling which moves the battue-shooter of the present day; his only motive is an ignoble envy to make bigger bags than his neighbours. It is slaughter for the mere gratification of a paltry vanity. This so-called 'sport' does unquestionably lead to the destruction of all wild life indigenous to the woods and fields. Let anyone who will visit a keeper's lodge, or read a keeper's books, and deny if he can, afterwards, that all the birds of field and forest, stream and pasture, moor and hill, are being exterminated for the sake of artificially preserving the game. Domestic animals, if they get out in the parks, are trapped or shot to the same end. A friend of mine, whose son possesses very large shootings, is obliged to walk in her own park with her little dog in a leash, lest he should disturb the game by his gambols!

"Everything is sacrificed in England to an unnatural slaughter artificially sustained, provided for, and fostered. This is not a matter of conjecture, nor of what is called sentiment; it is a matter of fact. As regards your quotations from Hurstmonceaux' speech in 'The Massarenes,' it was not necessarily summer because he was sketching some persons are so odd that they prefer sketching to shooting even in winter. I have not a copy of my book at hand where I am writing this, but I think it is stated that it was the last day of the hunting season when Hurstmonceaux saw the fox. Does the huntsman invariably verify the sex of a fox when the hounds have given tongue?

About the cubs I may be wrong, but I think I have seen them before the trees were in leaf in northern woods. Very small things, just born. It is perfectly possible for a man to lead the life of a country gentleman, and yet renounce all sport. I know one, at least, who has done so, and who is not the less respected in his country, although he makes his reformed opinions very forcibly heard. It is time, I think, that it should be recognised that people are not necessarily prigs, fools, or women because they view with disapprobation, even with disgust, the mania for slaughter, as introduced into Great Britain by Prince Albert, and patronised by his sons and grandsons. It is time, I think, that even the fanatics of sport should recognise that there is about it nothing admirable, manly, or deserving of praise, and that when men of rank make it the be-all and end-all of their existence they cannot wonder if others may consider that such existences are of slight value, if they are not injurious and contemptible. I regret to be obliged to admit that in our immediate day women are as guilty in this respect as their male relatives and friends. The 'crack shot' of the 'big shoot' is not seldom nowadays a woman, by courtesy deemed gentle."

We are well aware that pheasant shooting must be indulged in to be understood. On hearsay evidence, even that supplied by the shooters themselves, it must seem absurd to expect pheasants to come to the call of the keeper in the morning, and fly from him as if he were their worst enemy in the afternoon, when the coverts are being shot. And yet it is an everyday affair, preposterous as it appears to intellectual inexperience. It is, of course, open to anyone to say and to think that the mere skill in hitting fast flying pheasants is not of itself a worthy object of ambition; to others it may appear infinitely preferable to burning the midnight oil in the creation of fictitious animal lusts—just as if there were not enough and to spare of them in everyday life already. To the true sportsman the fast high-flying pheasant is a challenge that he cannot resist the temptation to accept, not even if, the moment before, he has been moralising upon the vanity of earthly pleasures, or wondering how much each pheasant in the bag will cost him at the end of the day.

Perhaps, however, we ought to give Mr. Watson's reply to "Ouida," as it is his knowledge of the

matter that is challenged in the above quotation. He says :—

“ The majority of my readers are acquainted with the subject she criticises, and are aware how hopelessly wrong she is. Owing to the kindness of some extremely good friends, if I do not now ‘ know anything of ’ what ‘ Ouida ’ calls ‘ battue-shooting,’ I must have neglected my chances year after year for a long time past. I have certainly fired a good many cartridges annually ; in fact, I do know something of shooting—the word ‘ battue ’ I scarcely remember to have *heard*, often as one reads it. Perhaps the most utterly preposterous idea in ‘ Ouida’s ’ criticism is that about the ‘ wooden stands,’ on the one well-known estate, to the top of which men are supposed to climb to ‘ hit the pheasants more securely.’ ‘ Ouida ’ will be surprised to learn that the great object of a host or manager of a shoot is to get the pheasants to fly as high as possible. Nobody wants to blow to pieces birds that blunder out of a cover half a dozen yards from the muzzle of his gun. The higher the better, so long as the birds are in shot, is the ideal of the good sportsman : and if ‘ Ouida ’ is not misinformed as to the stands on the well-known estate, she would doubtless learn that they are put up because the pheasants fly from exceptionally placed covers at such a height that it is absolutely impossible to reach them from the ground. But her authority for the stands may not improbably be incorrect. I have certainly never heard of such a thing.

“ That tens of thousands of head of game are shot annually is of course a fact, but that the pheasant which is clean shot suffers more than the fowl which has her neck wrung I do not believe—or that either can really be said to suffer at all. Some birds are unfortunately wounded, it is true, but ‘ Ouida ’ would be surprised again to find how carefully such birds are sought for in order that they may not linger in pain. In many cases the game is sold. Why not ? Why should not the owner of an estate recover a part of the money it costs him to provide sport for his friends ? Some men do not sell. At one place where I have shot for several years past—a place where 2,000 head a day has been very nearly approached when I have been out (and though I cannot at the moment obtain figures, probably on occasions exceeded)—my host for a long time never sold a bird. He copiously supplied his friends, his old regiment, various hospitals, and all the cottagers within reach : but these latter, who accounted for a large proportion of the kill, very frequently did not know what to do with pheasants and partridges. Much game was wasted, and what used to go to them is now sold to form a fund which is entirely devoted to their wants. Has it ever occurred to ‘ Ouida ’ how many thousands of brace of birds are given away every season to those to whom the gift

is really a boon? Has she ever thought of the multitudes of men who gain livelihoods in connection with shooting—keepers, attendants, beaters, and then again the hosts employed in making guns, cartridges, and shooting appliances? In one day's covert shooting last season somebody at lunch time calculated that we were utilising the services of over fifty men and nine horses.

“Much nonsense is talked about ‘tame’ pheasants. The wildness cannot be eradicated from the bird, and the so-called ‘tame’ pheasant flies just as high, as fast, and as strongly as his wild brother. I am afraid I must also stigmatise as nonsense the assertion that the ‘visitor’ who ‘does not kill his due quota of game at these big shoots is despised.’ For one thing, even with the system of changing places after each beat now generally in vogue, one man may have persistently bad luck all day in the way of chances, and another man may constantly happen to be at good stands where he gets an exceptional lot of shooting. A slight feeling of contempt may be felt for a man who does not let the birds rise, who blows them to pieces, continually wounds without killing, or shoots in a manner dangerous to his companions or the beaters: but a very moderate shot may be a good sportsman. ‘Ouida’ does not seem to consider that the ‘form’ of the ‘visitor’ is, as a very general rule, well known, and a host would be an idiot to despise his guest for not doing what he was never expected to do. With regard to the lady who is obliged to walk in her own park with her little dog in a leash, an outrage which draws from ‘Ouida’ a note of exclamation, I can only say that if she is a woman of ordinary common-sense, with a dog that is not well enough trained to follow her, and is given to running in the coverts, she very willingly accepts the obligation. I wonder, by the way, that ‘Ouida’ is not sympathetic about the poor little young birds who would be terrified by the ‘gambols’ of the little dog—presumably a poacher. To blame Prince Albert for the existing fashion of shooting is not less wide of the mark than the majority of ‘Ouida’s’ other statements. It seems to me that the present system of shooting is mainly or entirely due to the invention of breechloaders. With two guns out and an expert loader, a good shot can do what was utterly out of the question in the days of the percussion cap. One special point more and I have done. Shooting does *not* ‘lead to the destruction of all wild life indigenous to the woods and fields.’ If ‘Ouida’ would condescend to read the chapter headed ‘Vermin’ in the Badminton Library Shooting Volume, she would find an earnest plea put forward for the preservation of various birds and beasts that are often ignorantly charged with mischievous habits of which they are innocent. As for the woman ‘crack-shot,’ in a varied experience of shooting in all parts of the country, I have never seen a woman fire a gun: but in this respect I

agree with Ouida ' that for various reasons shooting is not a desirable accomplishment for a woman."

With all this we very heartily agree, if we except Mr. Watson's denial of the stands in the woods for the guns to stand upon when pheasant shooting. We know of at least one shooting where they do exist, and it is such a well-known place that it is odd Mr. Watson should never have heard of it. The popular owner of this shooting explained to us the reasons why they had been put up twenty-seven years ago, when we were shooting with him on his grouse moors; but, as we never saw them in use, we quite forget what the reasons given were, but we fancy they were that the stunted oak trees, of which the cover was composed, were too thick to afford the sportsman a proper sight of the pheasants from the ground. Be that as it may, we are quite certain that it was not for the purpose of taking an unfair advantage of the birds, or blowing them to bits, a practice which would have been at once condemned by the owner of the shooting in question, if only on financial grounds.

But it is not at every shooting where the high ideals of the sportsman are attempted to be carried out. And we have many a time seen the guns crowded up into corners within fifteen or twenty yards of the rise of the birds, and yet this was "called" driving the birds forward over the guns. There is, we assure Mr. Watson, quite as much improper as proper handling of pheasants in vogue. It is all very well for the guns in line with the beaters to let the birds off when they blunder up at their feet; that is not always followed by the guns at the corner letting those birds alone that rise in the fence, in order to concentrate their attention on those that come over from a distance. There is some excuse for "Ouida" if she has seen this sort of thing. Unlike Mr. Watson, we have seen a woman shoot, and shoot well too. We do not see any harm in it, either, and we do not agree with somebody who has lately said that there is no such thing as a sportswoman, although there are many women who like to show the men that they can do as much as they. Thirty years ago we first came across a

shooting lady. She was on the next shooting lodge to ourselves in Perthshire, and she usually went out without shooting companions, and invariably was one of the last to get home, whether she happened to be after deer or grouse. There was no "showing off" there.

But perhaps a better excuse for "Ouida" than the occasional plastering of newly-flushed pheasants is to be found, if we search for it. We remember ten years ago, when the cry against the Press critic first arose, that we were one of the first to bring home the misbegotten child to the recognition of his undutiful literary parent. At that time we quoted a passage from an editorial article in the *Field* which was considerably more "advanced" even than "Ouida's" modern maiden ethics. We do not know whether there have been later attacks by that journal on the same lines, because we are not studious readers of its columns. This is the attack to which we refer :—

"It is for the purpose of the 'battue' that pheasants are now reserved and preserved with all the formidable retinue of head-keepers. . . . No one can deny the fitness of the pheasant for affording gratification to the *good sportsman if the bird is fairly found*, put up and shot; but as well might mobbing a fox be called fox-hunting as a 'battue' be considered genuine pheasant shooting.

"In the 'battue' nothing short of hundreds, or, if possible, thousands of killed, to say nothing of wounded, will constitute a successful day. The pseudo-sportsman, who should be tempted from his *Times* and his fireside for anything under five brace an hour, would be inclined to complain, and would think, if he did not say, that his presence had been obtained under false pretences. The mode usually adopted is as follows :—

"First get together eight or ten crack shots, who may, many of them, be in wheeled chairs, or on shooting-ponies. . . . Domestic poultry must be reared and killed, but who would admit the pleasure of wringing their necks or cutting their throats? Yet where lies the difference? The pheasant is not even a difficult shot."

"If the bird is fairly found, put up and shot," suggests the hedgerow and the spaniel, or the pointer and the turnip field, and to place this manner of killing the pheasant before the modern method of rising him several hundred yards from

the guns and driving him home over their heads, down wind for choice, is no more grotesque than the suggestion that it would be better to wring the necks of the birds. This sort of rubbish has taken ten years to find its true level, and to do duty in the fiction loved by the masses, but we are not sure that it is altogether fair to blame "Ouida" for the sins she may have learnt by a study of the sporting paper quoted. We never did give assent to the justice of visiting the sins of the fathers on the third and fourth generation. Those who are inclined to blame "Ouida" cannot do so fairly, at any rate, if the original sinner is to be found upon their own tables.

PLASTERING THE GAME.

The Marquis of Granby has, in the magazines, expressed the opinion that there is often too great a quantity of game brought to the guns in covert shooting.

Lord Granby has the character of being a first-rate sportsman with the gun as with the rod, and it was clear that his article was directed at the mistaken notion that quantity can be made to serve true sportsmen instead of quality. In a later article Lord Granby has advocated the preservation of birds that gamekeepers usually regard as most destructive to game, such as jays and owls; the former are condemned because of their partiality for eggs, and the latter because they are well known to take young pheasants when they first begin to perch on the coops. Had Lord Granby put forward either of these opinions without the other he would, we fancy, have converted more sportsmen to his way of thinking than he will now. Most game preservers are not under the impression that they can have too much game, nor that they can secure at too cheap a rate what their keepers and their land rear. The preservation of jays, magpies, hawks, and owls, does not make the keeper's bill lighter, nor does it add to the bag of game. If, then, we have too much game for sport, most sportsmen will, we fear, prefer to lighten the gamekeeper's bill rather than to tax his staff with the preservation of a certain quantity of beautiful

vermin. Evidently Lord Granby's view is that we should **return**, more or less, to the balance-of-nature system which **was** in vogue before driving game and high preservation **became** the rules. We say "more or less" because Lord Granby limits his preservation of vermin to a few specimens of a few varieties, and this limitation is evidently the outcome of a conflict of interests between the nature-lover and the sportsman. Unfortunately, we cannot all think like Lord Granby, because we have not all got the means and the broad acres to experiment with. To most shooting men it matters very much whether the head of game is preserved on their limited areas to its utmost capacity or not. To Lord Granby it can matter very little. If there is not enough game on one beat he can go to another. The jay is a very beautiful bird, and he has his uses, for no bird is so certain to inform the gamekeeper of the presence of intruders in a covert. He is a sentinel whose sharp eyes permit of no intrusion without the warning scream. Covert shooting without the scream of the jay and the whistle of the excited, rushing blackbird to proclaim the whereabouts of the coming line of beaters, and to call the shooters' attention to the matter in hand, would not be quite the same thing as it is. Yet it takes wonderful good keeping to limit the number of jays, and extermination hardly seems within the bounds of possibility, so wary is the bird. No doubt when the frequent appearance of peregrines in Derbyshire and Yorkshire kept the stock of grouse within limits and made them lie to dogs the sport was just as charming as it is now, but as many people could not enjoy it. We think that there is no sport which excels that to be had far away from human habitation over a brace of good dogs upon the moors, with no man to look on and only ourselves to play the critic. And the genuine sportsman is always his own most severe critic. But the fault of all such predilections is that they are exclusive. The modern shooter endorses the poacher's creed to this extent—that game was not made for man, but for men. It is for this reason, to some extent, that shooting over dogs has gone out of fashion. It is the ruin of good dogs to have a line of guns behind them in place of the old-

time couple. Besides this, driving and preservation have so increased the game as to make it ridiculous in most places for a pointer or a setter to show his nose. Even before August the birds will rise in clouds upon some English moors at the sight of a man's hat above the sky line. Another good reason for the increase of driving upon dog moors is the scarcity of good dogs. Shooters have got field trials and dog shows so mixed up in their minds that they do not buy their dogs with the knowledge and discretion necessary to enjoyment on the moors, and the result of this is that driving begins early and the dogs are left in kennel to dream of their sins.

We fancy we should be right in saying that the grouse shooter over dogs had to be in training, whereas condition is all that is necessary for grouse and partridge driving and covert shooting. The latter state is infinitely the most pleasurable for the time being, but it is a question whether the harder work of shooting over dogs and deer-stalking does not best set a man up for the year, especially if his life compels a more or less sedentary habit of body.

The worst of shooting over dogs is that really good dogs are so scarce, and bad ones are so annoying.

In an article on shooting by the late Lord Suffolk and Mr. W. G. Craven, in the *Encyclopædia of Sport*, there is a good deal of abuse of the modern smart shooting. Here it is asserted that "the thing" is to bring down the birds as they top the beaters' heads, and that the man who lets them get to cookable distance is voted a bad, slow shot. The authors say :—"With sorrow and shame be it confessed that the gunners of the exterminating class are just now far too abundant. The number is increasing of men who go out shooting without idea or conception of the *sport* of pursuing game, but with the sole desire of firing off as many cartridges as possible in the shortest space of time and with the minimum of exertion. Soon we may expect to see them discarding the double-barrelled breechloader in favour of repeating weapons. Indiscriminate slaughter is the one object of these bloodthirsty individuals, and as they are in constant practice there are plenty of them who are tolerably unerring

shots at birds flying high or low. The more blame theirs for taking them, as they do, with cheerful complacency, within five or ten yards of the gun, so that the unfortunate host whose guests they are finds at the end of the day that at least half his bag is unfit for table or market. Quickness is the test of merit with these murderers; the 'plasterer' is their ideal; the man who kills his game at 'kitchen range' they call a slow, bad shot."

We had no idea that anything like this was to be found anywhere; no doubt there is some truth in the charge, but is it not exaggerated? If not, then Lord Granby did not speak before it was necessary in demanding quality of flight of the game rather than quantity of shots.

This evidence, on the authority of the late Lord Suffolk, confirms the slaughter theory of the lady novelists to this extent—that there do exist shooters, outside the novice, and duffer, and office-stool classes, who have constant practice at game, and yet are unworthy of the name of sportsmen, however first-class they may be as shots; and if this is true, Lord Granby is much more than justified in all he has written against shooting for the size of the bag. But, admitting this, we yet fail to see why a large head of game is detrimental to true sport, for it is just as easy to make a large number of birds give difficult shots as it is to make a small number do so. In any case, the old school, who were trained to a turn by following their dogs on the moors, were absolutely free from the practices of the "plasterer" either there or when they returned to the coverts; and if the latter really has grown into admiration in any quarters, it must be put down to the newer methods of killing game for the size of the bag.

NOT FOR THE SENIORS.

There is some excuse for the sporting newspapers' habit of repeating controversies the subjects of which have long ago been settled. A fortieth or fiftieth of the shooters join the ranks every year, and it is obvious that they are not posted in the old-time discussions. They like to settle for

themselves the merits of the 28-bore, or even those of the 410 shot gun; nevertheless, it does seem to be a waste of space when one remembers that any gunmaker is able to give sound opinions upon such subjects.

Of course, ladies shoot a good deal now, and it may be that they require lighter guns than their brothers and husbands, but that hardly necessitates rediscussing the comparative merits of different bores. Most people are strong enough to carry a 12-bore of 6½lbs., and, as every gunmaker knows, there are thirty 12-bores built for every one of any other gauge.

There is, however, one superstition about small bores that dies hard. Even the old generations that have been able, if not willing, to read the "hardy annual" any time these thirty years is yet inclined to believe that a 20-bore will give a closer pattern than a 12-bore. This is far from being the case. We have known several shooters who fancy it is more sportsmanlike to kill with the small bore, because they believe it to be more difficult with such a close-shooting gun and so small a charge. As a matter of fact, no 20-bore can be made to shoot as closely as a 12-bore, and between extreme chokes of both bores it is decidedly easier to shoot with the 20-bore, not only because of its wider spread, but because of the quickness with which the lighter weapon can be handled: also because of the small recoil and consequent quickness of the aim for the second barrel. Up to certain distances the small bore is much the easiest gun to use with success, but there is a distinct loss beyond them; that is to say, a rifle-like aim would fail to kill a sitting bird with a 20-bore five or ten yards sooner than with an equally choked 12-bore. Moreover, as the thickest part of the shot, or the killing circle, grows smaller quicker than that of a 12-bore, because of its fewer numbers of shot, it is obvious that there is less chance of killing with a 20-bore when the aim has not been exact at the longer distances. We should say that the small bores are easier to handle and to kill with within thirty or thirty-five yards, and to shoot with them much beyond such distances is cruelty to the game.

There is a distance, varying according to the game to be

shot, at which kills become chance work, in spite of straight shooting ; and anyone who has plated guns must know that the limit of certain distances is always nearer with the small bores than with the large. What are these distances at which it becomes cruelty to shoot at game ? We should be very sorry to attempt to lay down any law, for upon some days a man seems to be able to kill further than his gun. We mean that when the chances are all against the gun, a man will score time after time, when by the law of averages he had no business to shoot at all at such shots.

We often think that plating guns is a little too much relied upon by the inexperienced. There is, in our opinion, such a thing as a lucky shooter as well as the lucky shot. Fate, after all, may have as much to do with snapping the thread of life in the partridge and the grouse as she is supposed to have with possibly more important lives.

There is a notorious instance on record of four consecutive kills at wild ducks, all between eighty and 114 yards away, with a cylinder gun and No. 5 shot. Yet, if you plate such a gun at eighty yards at a bullseye the size of a duck, it does not encourage shooting at such distances. The distance, then, at which certainty ends and chance begins not only varies with the gun and gauge ; not only with the game and the position or angle of the game in respect to the shooter, but also to the man behind the stock, and possibly also with the day.

Eliminate the uncertain elements—the gun, the man, and the day—and we may perhaps be permitted to suggest some differences of killing distances between the various angles at which game is shot at. A hare, for instance, stretching out broadside on is not out of shot at fifty yards, whereas going straight away with her head visible she is far enough at thirty yards, and with her head out of sight, as it is sometimes when she goes straight away down hill, she is best left alone altogether, unless you prefer hare soup to jugged hare, for you have to plaster her to kill her with No. 6 shot. Early in August a grouse going away is nearer at fifty yards than two months later he will be at forty. Coming straight at the gun, low down, both grouse and partridges want a lot of

killing, whereas high up and over they show their soft places to the gun, and the shots do not then rattle on their feathers and fly off harmless. Pheasants going away are easy to plaster, but difficult to kill without plastering. High up, driven over the gun, they are easily killed when hit well forward, even with one or two pellets.

A rabbit, like a hare, is killed very easily broadside on and extending himself; he is harder and smaller, and forty yards in his case is equal to fifty for the hare; he generally shows more of his head than his taller-behind cousin when running straight away, and can generally be accounted for up to thirty yards in the open. A woodcock is nearly always obliging enough to come down when he is hit, and so is a snipe. Black game are very tender in August, but in October, when they have got their winter plumage, they are able to take away almost as much shot as a wild goose, especially from a straight-away or straight coming-in shot. High up, coming over, they are less difficult to the correct aim. Roe deer do not seem to be harder broadside on than a hare, and we have seen one killed dead at sixty yards with No. 6 shot from a 12-bore. Going straight away it would be cruelty to shoot at them with No. 6 at all.

The old aim used to be to kill a head of game for each shot fired. Now it is not even contemplated, and those who kill most game are those who shoot away most powder. But they are not necessarily the best shots. It is seldom one has time to watch another shooter very attentively for long: but the shooter who can make use of all his experience and shoot, or refrain, according to distances, angles, speeds, and size of object, right barrel or left, as the case may require, and do it as quickly as the man who blazes away indiscriminately, is, in our judgment, a better shot than the man who always shoots and always hits, but does not always kill his game.

DRIVING GAME, WALKING IT UP, AND DOG WORK.

In the foregoing pages we have recorded the conflict of average opinion at the present time. It will, we think, be interesting to the last recruits of the shooting-field to hear

what the average opinion was a little over a decade ago, and how the drivers of game had to fight before the dog men would allow that driving was really deserving the title of sport.

We therefore quote some of the discussion that raged round Lord Walsingham's phenomenal bag of 1,070 grouse in a day to his own gun. This appeared in *Land and Water* and *Shooting* in 1888 :—

BIG BAG OF GROUSE BY LORD WALSLINGHAM AT BLUBBERHOUSE.

The paragraph which appeared in Tuesday's *Yorkshire Post* to the effect that Lord Walsingham, on August 30, on his small moor at Blubberhouse, shot, in one day, to his own gun, 1,058 grouse, is certain to bring down an avalanche of incredulity. On August 28, 1872, Lord Walsingham made a bag, to his own gun, of 842 birds, a feat which has been disputed ever since, and it was this persistent denial which made his lordship attempt the bag now recorded, and concerning which we are enabled to give the following authentic particulars, kindly sent to us in September, 1888, and published in *Land and Water* :—

The bag was made between 5.15 a.m. and 7.30 p.m. The actual time occupied in twenty drives, from the second shot fired in each drive to the last shot in the same, was 7h. 29min.; thus nearly half the time was spent in waiting for the drivers or in picking up birds. The best drives were the fourteenth and sixteenth, ninety-one and ninety-three birds being bagged. Each of these drives occupied exactly twenty-one minutes, from the first to the last shot. The time from 7 to 7.30 p.m. was spent in walking home, during which fourteen birds were shot. Deducting these fourteen birds, and the half-hour occupied in shooting them, we get 1,044 killed in 449 minutes' actual shooting, or an average of very nearly $2\frac{1}{2}$ birds per minute. Once only during the day three birds were killed at one shot (the only three in view at the moment, as it happened), and three times two birds were killed at one shot, each time intentionally. A fairly strong west wind was blowing, which made the birds flying down wind fine sporting shots.

Four guns were used and two loaders employed. Not a shot was fired by anyone but Lord Walsingham. The reason the time of the drives was usually taken from the second shot is because a straggling bird frequently causes the first shot to be fired long before the main body of birds arrive, but it was found that this was not so often the case on this occasion as had been expected.

It is probable that some ten or twelve birds will yet be picked up when the ground is shot over next week. These should properly be

added to the bag. 1,036 were brought in the same night, and twenty two picked up the next day (without guns).

Two guns should get from 150 to 200 brace per day for two or three days next week on the same ground.

In connection with the above, the following notes from the Blubberhouse Game-book will be not uninteresting as showing the advantages of driving:—

							Season's Total.
1829, August 12 (three guns), 28 brace; 17th,							
25 brace	...	...	...	...	...	...	60 brace.
1830	...	..	...	...	...	...	77 „
1831	...	...	...	...	...	...	14½ „
1832	...	...	...	...	...	...	31 „
1833	...	...	...	...	...	...	82 „
1834	...	...	...	...	...	...	69½ „
1835	...	...	...	...	...	...	90 „
1836	...	...	...	...	...	...	12 „
1837	...	...	...	...	...	...	25 (?)
1838	...	...	...	...	...	...	42½ „
1839	...	..	...	...	...	...	26½ „
1840	...	...	...	...	...	...	26 „
1841	...	...	...	...	...	...	35½ „
1842	...	...	...	...	...	...	21 „
1843	...	...	...	...	...	...	91 „

No record.

Somewhere about 1862 a little “mild driving” was commenced.

							Season's Total.
1865	...	...	...	...	...	...	289 brace.
1866 (Best day, one gun, Lord Walsingham,							
221 brace)	...	...	...	..	...	...	691 „
1870	...	...	...	...	...	...	478 „
1872 (Best day, one gun, Lord Walsingham,							
421 brace)	...	...	...	...	...	...	807½ „
No record.							
1876	...	...	...	...	...	...	725 „
1877	...	...	...	...	...	...	781 „
1878 (Best day, two guns, 372½ brace)	...	...	...	...	...	...	704 „
1879	...	...	...	...	...	...	241 „
1881	...	...	...	...	...	...	388½ „
1882 (Best day, three guns, 321 brace)	...	...	...	...	...	...	770 „
1883	...	...	..	...	...	...	346½ „
1884	...	...	...	...	...	...	622 „
1885	...	...	...	...	...	...	277 „
1886	...	...	...	...	...	...	646 „

From "Shooting," September 12, 1888.

"SIR,— . . . With reference to your further remarks, I take this opportunity to mention that your anticipations have been verified. Twelve more birds have been picked up, bringing the total to 1,070, and 1,786 grouse in all have now been killed on this same ground up to yesterday morning. Yesterday morning I took a walk to see what were left. Two keepers, with a pony and saddle-bags, accompanied myself and my loader—of course without setters or pointers. It was a quarter to one before I set foot on the moor, and during the day I killed twenty-six brace. This a few years ago would have been regarded as a very large bag to make over dogs on August 12, and, as a fact, the largest bag ever made here by one gun without driving has been forty-two and a half brace. It is remarkable that such a bag as twenty-six brace should now be possible after a cold, wet breeding season, which killed off a vast proportion of young birds, and after the actual stock has already been reduced by 1,786 on a total area of only 2,221 acres.

"WALSINGHAM.

"Blueberries, Otley, Yorkshire, September 8."

The following table shows the differences of conditions under which the three biggest personal bags of grouse on record have been made in a single day :—

Lord Walsingham, shooting alone, August 30, 1888, at Blubberhouse, 1,070 birds. Four guns and two loaders. Twenty drives: forty drivers being employed.

Lord Walsingham, shooting alone, August 28, 1872, at Blubberhouse, 842 birds. Four guns (two breech- and two muzzle-loaders). Sixteen drives: twenty drivers being employed.

Sir Frederick Milbank (one of a party of six), August 20, 1872, on Wemmergill Moor, 728 birds. Three guns and two loaders. Eight drives. (Total bag for the day, 2,070 grouse.) It should not be forgotten that the size of the Wemmergill Moors is nearly eight times that of Blubberhouse.

The Editor of the *Field* having written to Lord Walsingham, obtained the following information in reference to the guns and charges he used :—

"On August 30, when I killed 1,070 grouse to my own gun in the day, I shot with four breechloaders. No. 1, a gun made in 1866 by Purdey, subsequently converted from pin-fire to central principle, to which new barrels were made last year. Nos. 2 and 3, a pair

of central fire breechloaders, made also by Purdey, about 1870, for which I have likewise had new barrels. No. 4, a new gun made by Purdey this year to match the two mentioned above, but with Whitworth steel instead of Damascus barrels. The guns are all 12-bore, with cylinder 30 in. barrels, not choked. My cartridges were loaded by Johnson, of Swaffham; those used in the down-wind drives containing $3\frac{1}{8}$ drs. Hall's Field B powder to $1\frac{1}{8}$ ozs. No. 5 Derby shot; those used in the up-wind drives (where the birds, of course, came slower) had 3 drs. only of the same powder, with the same shot; not hardened shot in either case. I find I never go out shooting without learning something. If I had the day again, I should cut off the extra eighth of an ounce of shot, not on account of recoil or discomfort of any kind—from which I never suffer, although always using black powder—but because I failed to get as much penetration at long distances as I do with an ounce only. I distinctly remember firing three barrels at one bird, striking well in the body every time, but killing dead on ly with the last shot: the powder seemed to burn too slow. Another thing I learned was that Whitworth steel barrels are not desirable for a heavy day's shooting. The explosion in them makes quite a different sound from that given off by Damascus barrels: there is more ring about it, and I can imagine that this might prove a serious annoyance to anyone who minds the noise of shooting. I have no recollection myself of ever having had a headache from gun-firing. Moreover, the Whitworth barrels become hot much more rapidly than the Damascus; and this is a serious drawback, especially to a man who shoots without gloves. I can well imagine that they last much longer, and are in many ways suited for ordinary light work; but I am now replacing them with Damascus, as in all my other guns."

A Letter from LORD WALSLINGHAM to us, published in "Land and Water," October 19, 1888.

"IS DRIVING SPORT?"

"SIR,—The amicable conflict of opinion on the subject of 'Sport' to which publication has recently been given in the columns of *Land and Water* and other newspapers connected with rural pastimes, has been watched with much interest by those who habitually engage in such pursuits. I doubt if any of the numerous correspondents who have taken part in it have succeeded in defining precisely, in a manner satisfactory to the sporting public, what is 'sport,' or what constitutes a true 'sportsman.' Such precise definition is indeed impossible for what must be always, more or less, a question of opinion and of taste. Conscious of being regarded as the greatest personal sinner in this matter, I had determined to keep clear of the debate, and not to

expose myself directly to the free firing that was going on, but I can no longer forbear to write a few words in support of the opinions very rightly expressed from time to time in your editorial notes and articles. The first question appears to be, Is driving of grouse or partridges sport, or is it not sport?

“Without attempting, then, to define what actually constitutes sport, I am prepared to contend that driving cannot logically be separated by any imaginary line of demarcation bounding true sport, from walking up to birds or shooting over dogs. Probably everyone will admit that in the pursuit of game cunning alone without skill can scarcely entitle the most successful fowler to the dignity of a sportsman, and I for one should be willing to admit that skill displayed without need of head work, or otherwise cunning, cannot alone be held to justify the appellation. Sport, in the true sense of the word, requires the exercise of skill and courage. To illustrate this, I would suggest the case of a man with a gun walking along a road seeing a covey of partridges over a hedge sitting on the ground barely within shot; if he shoots at them sitting, whether he kills one or all, the minimum of skill is required, and his method of obtaining them cannot be called sport. If, however, he puts his pointer dog over the fence, and when the dog, ranging round, finds the birds and points them, he walks up and shoots right and left as they rise, this comes fairly within the definition of sport. Another plan of action would be to get over the fence at a distance without a dog, and to approach the birds by gradually diminishing circles until they rise and afford him a flying shot—surely also a sportsmanlike proceeding! Now, if instead of adopting one of these three plans he were to point out the birds to another man, and request him to walk round to the opposite side of them and drive them towards him while he remained in concealment, I ask, why would this be no longer sport? The shooting on the ground requires comparatively no skill, the other three systems all require skill, the driven shot probably more than the others. Since the shooter knew where the birds were, the assistance of the dog was superfluous and wasteful of deputed cunning; therefore the approach without the dog was the better sportsmanship, his own cunning as well as skill being brought into play; but in the two latter cases the risk of putting up the birds a long way off was probably considerable, and the driving method offering the best chance of success, thus becomes that which exhibits the highest cunning as well as probably calling for the greatest skill. According to my ideas, the sportsman who adopted the fourth alternative in preference to the other three would take the prize.

“In the ‘Field and Covert’ volume of the ‘Badminton Field Sports,’ p. 103, I ventured to suggest that ‘one of the chief attractions

of true sport' was to be found in 'the satisfaction' a man may enjoy in 'feeling that a knowledge of the habits of the game and of the manner in which it can best be approached has enabled him to reduce into possession in a sportsmanlike fashion a goodly proportion of whatever numbers may have been available within the area traversed.' This definition, good only so far as it goes, reminds me of another element of true sportsmanship—*i.e.*, the avoidance of waste. Waste may be incurred in many ways. The stock of birds may be so reduced by too much shooting as to injure the sport in the future. Birds may be driven off the ground by unskilful management or persistent disturbance, so that the proportion realised would be greater under a less wasteful system. The birds or animals pursued may be killed in such manner as to injure them and render them unfit for food; this is obviously wasteful and therefore unsportsmanlike. In short, a good sportsman must reduce his game into possession without waste, present or prospective, and the degree of success attained in this matter must be taken into consideration in estimating the quality of his sportsmanship. Here again a number of changing circumstances and conditions affect the question. A man who has one month's holiday in the year to devote to sport should manage his ground in one way; another who has to depend upon the same acreage for the whole season should manage it, perhaps, in a very different way. The object of both would be the same in one sense, *viz.*, to secure the maximum of enjoyment consistent with bringing to book the largest number of birds the ground can be made to yield without unduly diminishing the breeding stock; but, whereas the one should endeavour to kill as many birds as he could in a short time, the other should distribute his sport over a longer period, and thus avoid waste of enjoyment, always provided that such distribution shall involve no ultimate diminution (= waste) in the total results. On all English moors there is about a week or a fortnight in every season more favourable for driving than any other time. It occurs just when the birds of the year acquire sufficient vigour to take long flights, but before they attain to the same degree of strength as the older birds. In short, it is the moment at which the packs can be broken up by repeated moving instead of being driven off the ground in large masses as they would be a week or ten days later. This is the time to choose if a large bag is to be made; but successful driving cannot be long continued unless on a very extensive acreage; not only do grouse become rapidly stronger and take longer flights, but they learn the points of danger, and decline to face the spots where guns are habitually posted, preferring to turn back over the drivers, in spite of flags or shouting, which is always useless after they have once seen the shouter. I have no hesitation in saying that on any English moor

of, say, 2,000 to 4,000 acres, persistent moderate driving or persistent dogging or walking throughout a whole season would yield poorer results in numbers in the long run than two or three big days at the best moment, supplemented by a judicious picking-off of outside birds whenever the weather is favourable. Thus any other plan would be in greater or less degree wasteful, and therefore less sportsmanlike. In proof of this, I may mention that on the Tuesday following my big day, when I killed 1,070 grouse, on August 30, we saw more birds in the first drive than I saw in any one drive on that occasion; but they appeared once only. The whole pack went off the moor, and had not the ground been left quiet shortly after to encourage their return, they would probably have been lost to the stock for the following breeding season.

"Many writers on this subject have attached great weight to the element of exertion in estimating the quality of sport. They seem to think that the more a man walks the better is he entitled to the appellation of 'sportsman.' Here, again, circumstances alter cases. I have run for the greater part of a day, keeping up as well as I could with a pack of harriers. So long as I did not head the hare, would they regard me as a better sportsman than those who enjoyed the luxury of the saddle? I have walked after grouse on Blubberhouse Moors till my nose bled, and all the keepers took off their coats, and that in the days of dogs, simply because I got more shots by doing so than if I waited for about two points in every three hours, while birds were constantly topping the sky line. There was necessity for great exertion if a creditable bag was to be made. But would the man who walked too fast, and killed less than a slower and more careful worker, be regarded as a better sportsman? Surely, no! Moreover, is a man who cannot walk at all no true sportsman because he shoots off a pony? The quality of sport or of sportsmanship must surely not be judged according to the amount of exertion required, although the enjoyment of healthy exercise is one of the charms attaching to the pursuit of game, and would not be lightly sacrificed by a healthy man for any small or doubtful increase in his bag.

"I also fully admit that to see good pointers or setters carefully quartering the ground enhances the pleasure of shooting even to a greater degree than mere exercise of lungs and sinews; but if one feels that the system involves waste of time and opportunities, and disturbs a vastly larger number of birds than it enables him to approach, he should at least not despise other methods requiring greater skill and more cunning, while insuring larger results.

"I am confident that on all Yorkshire moors a really good walker can kill more grouse without pointers or setters than with them, so long as he behaves fairly by his dogs and gives them time to work

their ground. If he uses dogs he must keep within sight of them, and, as his head is always higher than the dog's, the birds can see him at a greater distance, and as soon as Yorkshire grouse see a man after August 25—and in most seasons much earlier—they move off. The way to make a good bag without driving is to go as quickly as possible from place to place, seeking out every hillock or inequality of ground on the chance of birds being within shot behind it. In this way only can they be approached after they have got up their feathers and strength. Of course a few scattered birds may sometimes be found to lie in good cover; but, again, I say a good walker, if he knows his ground and shoots equally well, will beat any man with dogs. He loses the pleasure of seeing the dogs work, but has himself to exercise sagacity instead of leaving the dogs to do it for him; and I fail to see that his work is less sportsmanlike.

"There are many places where game is scarce in which dogs are unquestionably of the greatest use. A forty-acre field, with but one or two coveys of partridges in it, taxes the patience of those who undertake to find them without such help. The large, open fields of rough grass on the borders of the fen lands in Norfolk and Cambridgeshire, unless richly stocked with birds, would show the use of a brace of good pointers. The ground could be covered in less than half the time it would take to get over it without them. On many Scotch moors, thinly stocked, where grouse lie far better early in the season than they do in England, setters or pointers are of great advantage, especially to a solitary sportsman. But why should anyone be thought not to understand the real business of sport because he declines to adopt a method by which hundreds can be bagged in places where thousands can be got by other means, and that not once in a way, but year after year on the same ground?

"A prevalent opinion among those who *don't* know is that driving is not sport, because the shooters have only to send out beaters, and themselves sit still and shoot till they are black in the face.

"One correspondent of *Land and Water*, under the signature 'Militat in Sylvis,' is much nearer the mark in suggesting that the real credit for a successful day belongs to the head driver rather than to the shooter. Where the master takes no part in directing the manœuvres this is so; but, whoever may deserve the credit in particular instances (my keeper, Thomas Harrison, although he followed my instructions precisely on the red letter day alluded to above, is himself a master of the art of driving), there can be no doubt that an immense amount of management is required to bring grouse or partridges successfully to the guns—much more so to a gun throughout a whole day. Every man must be in his right place and at the right moment. If one goes wrong he may spoil the whole

day's work. On August 30, two drives were spoilt in this way—the birds left the moor; luckily I had a few men on the opposite hill to guard against such a contingency, and we recovered them before the two best drives. A carrion crow, a heron, a hawk, or a balloon, as I have twice seen, passing over the moor, will put off great packs of birds, and spoil, not only one or two drives, but frequently the whole day's sport. This, when it occurs, is unavoidable, and is nobody's fault.

"I think I have shown that a considerable amount of head work, or cunning, is necessary to bring about success in the process of driving grouse; to drive partridges properly requires even more. There can, I think, be no question that although a large number of the shots obtained in this manner will probably be within a very reasonable distance, the pace at which they come, especially when there is any wind behind them, renders the birds more difficult to hit than if they were rising from the ground at the same distance. Moreover, in order to do full justice to his opportunities throughout the day, and thus avoid waste, a shooter must not pick his shots, but must fire at every possible bird within killing distance. Fifty or even sixty yards is not too far if the gun is held well forward on a crossing bird—one pellet in the neck or head will bring him to book: but these long shots naturally require a high degree of accuracy to minimise the risk of inflicting mere body wounds, and the great variety in the angle, elevation, and distance at which driven birds pass the batteries must always render perfection far more difficult of approach in this method of shooting than in any other. We have, therefore, a combination of skill and cunning, the two necessary elements of true sport, and if exercise is desired a man can generally get as much as he wishes in moving from one battery to another, and in picking up his birds after each drive. Some are sure to fall at a distance and to need careful seeking.

"Good retrievers are wanted, and I know no better training for a young dog than to let him work with a couple of good, steady, but experienced older ones. It teaches him to be quick in the return, bringing bird after bird, as long as they are easily found and seeking diligently in a spirit of rivalry when there are but few left to gather. There is usually plenty for all to do, and by the end of a drive a running bird will often have reached a distance of two hundred yards or more, giving a dog every chance of showing his quality.

"Another idea that has been started is that a man who sells his game is no sportsman. I fail to see how this in any way affects the question; but here, again, the facts, which are no secret, may speak for themselves. In round numbers, out of 2,000 grouse bagged in the season of 1888 on my 2,200 acres, 500 were given away to friends and 1,500 were sent to market.

"I venture to think the consuming public, the majority of whom cannot taste grouse in any other way, were distinctly benefited by this arrangement. The producing owner's expenses were, of course, proportionately diminished, and the number of sheep fed on the moor being the same now as twenty years ago, namely, 1,440, besides a few head of cattle and horses, I fail to see that grouse driving is, after all, what some people regard as such a terrible curse, or that anyone can justly complain of being a penny the worse.

"Several other points connected with the general subject seem to deserve at least a passing notice. Some would contend that the element of danger enhances the enjoyment of sport. For this reason it may perhaps be said that shooting tigers on foot is more sportsmanlike than shooting them from an elephant, and from this point of view a poacher may surely claim to be the truest of sportsmen, since he is not only the pursuer, but often also the pursued.

"He can appreciate the sense of excitement which is said to stimulate the fox as well as the hounds. Perhaps this may be taken as a sufficient excuse for what would be called his unsportsmanlike methods, and certainly the practice of netting or trapping birds could, under no other circumstances, be brought within the definition of sport; but the successful pursuit of his illegitimate calling frequently requires careful study and knowledge of the habits of game, and in this sense he must be admitted to possess one of the chief attributes of a true sportsman. It seems to me when people talk of what they call the 'screen business' being more like poaching than shooting, the compliment to those who practise it is not necessarily a poor one. The real indictment is that shooting from a place of concealment must be more or less mechanical, and therefore calls forth at the moment no exercise of special energy, judgment, or sporting science, and is too unfair upon the birds, owing to the amount of extraneous assistance called in.

"If this be so, and if shooting over setters is really fairer and more scientific than driving, the same argument would bring us back to the old fashion of hawking, and salt would certainly be fairer, as giving the bird a better chance of escape than powder.

"There can be no doubt whatever that for some reason or other the numbers of grouse on our English moors have very largely increased during the last twenty-five years. This has been attributed, as I think rightly, to the system of driving, scarcely known before that time. The proportionate increase in the numbers rendered available for food has been even greater than the increase of stock. In the county of Yorkshire the gain cannot be estimated at less than 400 per cent. I could name more than one moor on which it has been nearly as much again.

"If we take alone the money value of such increase it is no inconsiderable benefit to the community at large, and the gain in point of sport and enjoyment to the few fortunate ones is proportionate; but the advantages of driving do not end here. Greater attention is now paid to the care of grouse and the condition of heather on moors. In former days, when dogs were used, there were many moors on which the proprietors were greatly opposed to the system of burning heather. It was considered to deprive the birds of cover, making it more difficult to approach them, and those who had a right of pasturage on the hills were wont to find their sheep in poor condition owing to the want of nourishing properties in old, rank-growing heather, with which the greater part of the ground was covered. Now, on the contrary, it is considered of more importance to provide a good supply of young and healthy food than to insist upon a large acreage of cover for the birds. The result is that more old 'ling' is burnt every year on all well-managed moorlands, and the young shoots of the constantly new-grown heather make good food, and plenty, for the sheep, as well as for the moor game. Keeping a moor well drained also tends to secure the same good result, to the benefit alike of the farmer and the sportsman. So great is the recognised advantage of burning at the present day that many are inclined to attribute a portion at least of the recent increase of grouse to the constant supply of fresh food thus created. It does undoubtedly enhance the good effects of that system of pursuit by which the older and more pugnacious birds are the first to come to the gun, tending to an equitable apportionment of favourite breeding places among a far larger number of birds than would otherwise have been allowed to remain upon the ground. Nothing is better known to keepers than that old birds will in the breeding season appropriate to themselves a much larger space around their nests, by driving off all intruders, than young birds; and if you want to multiply the number of birds on a moor, you must kill off as many old birds as possible. There is also an extreme probability that burning has a tendency to prevent periodical outbreaks of the epidemic known as grouse disease. If the entozoic parasite discovered by Dr. Spencer Cobbold is the true cause of, and not merely accessory to, the disease, the idea at once suggests itself that, like other parasites, it probably passes its embryonic stages in some intermediate host, such as one of the smaller molluscs, as in the case of the liver fluke of sheep, or in the common earth worm, as in the case of the well-known gape worm of fowls and game birds. The ashes of burnt heather would be as good as a dose of salt for the destruction of such possible intermediate hosts, not to mention the cooking process, which would be even more effectual.

"The fact can be vouched for that disease is less prevalent on moors where an annual system of burning in proper proportions to the acreage is regularly carried out, and the highly beneficial effect upon the stock of birds goes far to justify the inference that it is not solely attributable to the increased supply of healthy food.

"The leading article in your paper of the 13th reached me just as I was posting my letter. Your opinion that driven birds are not more difficult to shoot than October and November grouse rising from the ground is one to which you are fully entitled; but, while acknowledging the generous support you have given to what is my view of the whole question on many points, I differ from you in thinking that the perfection of sport *does* greatly depend on what results one can get out of it.

" WALSINGHAM."

To this letter we, at that time, attached the following remarks:—

"[It will be noticed that Lord Walsingham agrees with most of the opinions we have expressed upon this subject, but in two points we are at variance with him. The first is when he—charitably to his opponents, as it appears to us, but at the expense of his guests at grouse-driving parties—declares that the exercise of cunning is a necessary adjunct to sport. If Lord Walsingham were to invite us to shoot with him he would manage the beat, as he describes above, yet we should consider that we had had *sport* if the bag were at the end of the day anything like what Lord Walsingham's bags usually are. Would he deny that we had? We should have exercised no cunning, as it is described above by Lord Walsingham, but skill only. The hunting man would also by this theory be barred from the title of sportsman if he merely rode well up and saw the sport. The second cause of disagreement is more apparent than real, we believe. Lord Walsingham disputes that sport is the exercise of sportsmanship for enjoyment, and *not for what can be got out of it*. The italicised portion is that to which he objects. When we wrote it we had an eye on mug-hunters and professionals of all kinds. Racing, in its purest form, is the highest form of sport, but in its purest form it is done, not for what can be got out of it, but primarily for enjoyment. Even in shooting, if Lord Walsingham had killed 1,070 snipe or teal—an impossible feat—in one day, his bag in size and what he could have got out of it would have suffered, but not the sport, surely.]"

The following letter was addressed to us in 1888, immediately after the above, and appeared in "Lund and Water";—

"SIR,—I have read with great interest the somewhat heated yet most interesting discussion that has lately taken place in *Shooting* concerning shooting over dogs and driving.

"It appears to me that the advocates of driving are somewhat inclined to advocate driving everywhere, and those who are in favour of using dogs would like to see them in same way in general use. Now, allow me to say that, speaking broadly, the following axiom may be laid down:—'Where dogs are used, driving is, as a rule, not possible; and where driving is the rule, dogs are more or less useless.' Driving is generally practised on large, flat, well-stocked moors, where the birds have of late years enormously increased, by reason of careful preservation and vermin killing. On such moors the birds are so numerous that, when a few are flushed, these flush others, and, finally, the original birds form part of a large pack that probably career clean away for the day, very possibly over the boundary. On such ground dogs, however well broken, merely drive the birds before the shooter, and, instead of assisting, militate against his chances of a bag. On moors on which dogs are usually run the ground is broken with tussocks, and shows small valleys and hills partly covered with bracken; here dogs are invaluable and a necessity, and driving could not be practised with any success. I imagine that dogs were used in bygone days (and are now) not so much as an accessory to sport but because the game could not, in certain places, be found without their aid, especially in regard to partridges, as the cover was in those times high and close, and in respect to grouse the birds were few. I take great pleasure myself in seeing good dogs work, and to see them find the game which, without their aid, might be walked over; but the actual skill of shooting over dogs is mere child's play compared with the marksmanship required when driving. Birds getting up before dogs nearly always offer the same shot, a low, straight, easy one.

"I was discussing the pleasures of shooting over dogs the other day with a rare old sportsman, who remarked to me, 'Yes, many and many a happy day I have had seeing my dogs work, but if the birds lay well I always felt I was taking a mean advantage of them—it was like shooting them out of a trap at ten yards rise! I have often,' he added, 'exterminated whole coveys, shooting the birds one after another as they fluttered up at my feet. The dogs did their duty, but the poor birds had not a chance.' Now, although I do not go quite to this length, I feel there is a good deal of truth in it. For myself, I delight in seeing dogs work, and I could walk all day with a man to see his dogs work if good dogs, and carry a walking-stick

myself and be quite happy; but, on the other hand, I am as fond of shooting as I am of dog-breaking, and I could shoot driven birds all day and be quite happy too, as the latter sport is a test of skill with eye, hand, and brain, as applied to the use of the gun, and the strongest exponent of dog-breaking cannot say there is much skill in shooting game over dogs. I consider there is as much actual sport in seeing a smart retriever recover a wounded bird after a drive as there is in seeing a pointer or setter find birds to be shot at when walking.

"It always amuses me to read the arguments of the dog shooting man when he is condemning the man who drives. The former never takes into this consideration that the man who drives drives simply because his game cannot otherwise be obtained. One of the most sensible and pertinent letters on this head I have read for a long time appeared in your paper of October 10, signed 'L. H.,' and perhaps one of the most silly is the one signed 'W. J. Poynz,' in your last number. This correspondent harks back to the dark ages of the discussion, talks of birds being shot in a heap on the ground, and compares driving to a 'youngster shooting starlings,' or a 'gardener, sparrows,' and asks, 'Is it not fairer to give the birds a chance?'

"Of course your correspondent never saw any driving, *that* goes without saying, or he would know that birds rising slowly, as before dogs, and presenting tail shots, have far less chance than birds driven at full speed, like arrows past the shooter, and at all angles; but I fancy your contributor, from the way he writes, imagines that driven birds are killed half-a-dozen at a shot, or why should he compare them to sparrows and starlings mowed down by a youngster or a gardener? It is no use fighting against the circumstances of the day, brought about by changes and improvements in agriculture and mechanics, any more than it was of use for the enemies of breechloaders and railways to uphold the supposed advantages of flint locks and stage coaches. I think nothing is more amusing than to hear the enemies of driving, when driven into a corner for an argument, say, 'No exercise, such cold work standing in a butt all day.' How often have I heard a tired grouse or partridge driver, after toiling up hill and down dale from one line of butts, or stands, to another, covering, perhaps, twelve to fifteen miles in doing so, remark, 'Oh! if those people who will write and say there is no exercise in driving felt as tired as I do now, how pleased I should be.'

"Now, Sir, do not imagine I am decrying the sport of shooting over dogs. I delight in it, especially in a wild country. What I am endeavouring to point out is that for skill in shooting, driving is beyond compare above shooting over dogs; that the game has more chance, owing to its rapid flight: and that the shooter has to use

his legs, arms, eyes, hands and brain as much and more than is requisite when he is shooting over dogs.

"Some writers would have us believe that the shooter, when driving, is a mere machine, and that the beaters are but assistant machines, and that an army of men sweeping over a parish or two is all that is requisite to send the game to the gun. These good folk are quite ignorant that the direction and force of the wind, the position of the boundaries, the natural haunt of the birds, the nature of the cover, and other points that often require instant and clever generalship, have everything to do with the day's success. I have known a line of guns hurried out of their butts—guns, dogs, cartridges, loaders and all—and scampered across a valley, through a river, and to a ridge a mile distant, where they had to crouch down as best they could out of sight because the far-seeing eye of the host had detected a change of wind just as the drivers were getting into position. I allude to this as no hardship in any way, but as an example of brain work in order to circumvent the birds, which in this case were grouse.

"Perhaps the most amusing definition of the differences of 'Dogs versus Driving' I ever heard was this:—When shooting over dogs the dogs do everything, and the shooter does nothing. When driving the dogs do nothing and the shooter does everything.

"RALPH PAYNE-GALLWEY."

*A Letter written to us and published in "Shooting,"
September 26, 1888.*

"SIR F. MILBANK'S BIG GROUSE BAG.

"SIR,—In reading over the various paragraphs that have appeared in the papers on the subject of the great bag by Lord Walsingham, I am induced once more to write a few lines, as my shooting on the Wemmergill Moor in 1872 has often been alluded to. I may mention, in the first place, that your editorial note in *Shooting* of September 12 is not quite correct. You state that the size of Wemmergill Moor is nearly eight times that of Blubberhouse. Lord Walsingham, in his letter, states Blubberhouse Moor to be 2,221 acres. Now Wemmergill Moor is under 12,000. I don't wish to under-rate the great exploit achieved by Lord Walsingham, but only to point out that shooting singly, the smaller moor, for one day, has a very great advantage over the larger one, for the following reasons:—In the first place, the butts, or stands, cannot be far apart on the smaller moor, consequently less

time is lost going from one to the other, and in proof of this I observe that Lord Walsingham had eighteen drives. Now, on Wemmergill Moor it is totally impossible to get in more than eight drives in one day, shooting (as I did) with five others, six guns in all, and each shooter picking up his own birds after each drive, and then walking some distance to the other stands. It sometimes happens that you can get two drives forward, and back to the same stand, but in 1872 this only occurred at one stand on my big day, August 20. Had it not been for this double drive, we could not have got in more than seven drives. I calculate that, from the end of a drive (picking up your dead birds) to the beginning of another drive is nearly one hour.

“Of course, I am now speaking of the great shoot in 1872. Although I may be repeating what I wrote some years ago, it may interest a younger generation to know the arrangements made for picking up the dead birds after each drive, so that there could not be the slightest mistake as to the numbers killed each day. Each stand has a pony, with panniers, told off to it; it is the duty of the shooter to gather all his birds, lay them in rows, and note on paper the number. The man in charge of the pony also counts the birds, takes a note, and carries them to the game cart at a distance. The man in charge of the cart counts the birds as they are delivered to him. It is curious to see that, at evening, the keeper's return of the whole always exceeded by a few birds the claims of the combined shooters. Of course, this is accounted for by the drivers picking up some birds which had flown a long distance from the stands before falling dead.

“I observe the biggest drive Lord Walsingham records this year is ninety-three birds in, I think, twenty-one minutes, whereas my record was 190 birds in twenty-three minutes, and in two previous drives 142 and 124 birds. My eight drives on August 20 amounted to 728 birds, an average of 91 birds to each. I may mention that, in reality, on that day there were only five and a half guns, as Lord Rivers had travelled from London during the night and only arrived on the moor at two o'clock, consequently his bag was only 150 birds. The other bags, including my own, on the 20th, were:—August 20, 390, 326, 224, 252; 21st, 429, 288, 146, 120, 224 (five guns); 27th, 376, 281, 285, 196, 298, 246 (six guns). I have taken the above out of my game book.

“Just a few words more as to picking up the birds. In thick heather it is a difficult job, especially on a hot, still day. I read last year of a plan of marking the place where the birds fall. This may be done when you kill a few brace at a stand, but is totally impossible when you fire as quickly as you can take the guns from the

loaders. How about eight birds to the minute? No, the only plan is to trust to your man and dogs. I have always used spaniels that retrieve well—I find they are twice as quick as the large retriever; their noses being near the heather, they pick up birds in an incredibly short time, and never tire if well bred. I have observed the best large retrievers, and the more I see of them the more convinced I am that the spaniel is the right dog for the purpose; generally I have two of them in my stand, and I rarely ever lose a bird.

“It will, perhaps, be asked how I know this. My answer is that in the drives where my extra man can count the birds that fall, I then see my dogs account for all. Of course, as I have said, in very big drives you have no time to count, so must trust to your dogs. Besides, the more thoroughly broken the big retriever is, the worse he is for finding grouse. I am now speaking as to the time; it is a great advantage to have your birds picked up as quickly as possible, and then off for another drive. My practice is to have five or six of these spaniels out, two with me and the rest with a man to help my friends. I have given up the Wemmergill Moor, and now content myself with this much smaller moor of my own, but very good for its size.

“FREDERICK A. MILBANK.

“*Burningham Park, Barnard Castle,*
“*September 24.*”

Writing, shortly before his death, on the subject of his memorable day's grouse shooting on Wemmergill Moor, Aug. 20. 1872, when he killed 364 brace, the late Sir Frederick Milbank says:

“The charge was $2\frac{1}{2}$ drs. black powder and $\frac{1}{4}$ oz. of No. 6 shot. My three guns were 12-bore pinfire, by Westley-Richards. All the three guns I used in the great drive, in which I killed 95 brace of grouse, were so hot that on laying two of them down on a mossy wet bank close to the ‘stand’ it made it ‘smoke.’ It must, however, be remembered that the drive only lasted twenty-three minutes. It may be asked how I know this? It was in this way. At the very first shot I had, the hammer of my gun caught the watch chain, which drew the watch out of my pocket, and I then saw the time; and after my last shot I purposely took the time, as I then knew what an extraordinary drive I had had. I think you will say it was sufficient to make guns hot! For the last five or six minutes I was obliged to shoot from the ‘trigger guard,’ owing to the heat of the barrels. I have to ask, would some of the new powders we read of have stood this heat without

exploding? It may be the whole firing was so extraordinarily quick, from the first shot to the last, that there was no time for the heat to get through the cartridge case. Owing to the death (ten days ago) of my old keeper, Joe Collinson, who had been keeper on the Wemmergill Moors for a great number of years (and a better or more respected keeper never lived), some of our local papers, in reference to this great shoot in 1872, have been led into a few mistakes; and as the statement I now give has never been published, I am induced to give it to you, viz., during the season of 1872 myself and friends killed 17,074 grouse in forty-one days' driving. The number of shooters (as taken from my game book) averaged as near as possible five per day. The number of birds per day for each shooter was eighty-two. I think this is worthy of record, as showing what a wonderful season 1872 was for grouse. It will be a very long time, I fear, before we see such another."

MANY MEN, MANY MANNERS.

It is curious to read the remarks in defence of driving grouse and partridges that appeared in print in all seriousness as late as only eleven years ago. No one seems to have hit on the parallel of cover shooting, in which for many years driving the game had held its undisputed sway, and spaniels had been almost abolished. Walking with the beaters was only indulged in when much ground game was met with, and when it was desirable to prevent birds going back, or when there was not enough room for all the guns forward. On many estates now rabbits are few, and hares are very scarce, and the pheasants are therefore the one important consideration. In order to make the most of these, two lines of guns or more are formed at the ends of coverts, into which birds have been driven, and this is so arranged, where possible, that the birds have to cross over the guns going down wind to their own ground. This has more or less been a recognised custom for twenty-five years or more amongst those who really studied the subject of making the most of the birds; but it has come into more general use since the Ground Game Act gave all the ground game, when it had left the coverts to feed, to the farmers. This method of driving pheasants was admitted as sport everywhere amongst shooters, and yet there were many who could not agree

that the treating of partridges and grouse in the same way was sport. It appeared to us, in spite of our love of the dog, and our successes at field trials, that those who would cripple the game-producing capacity of estates in order to see dogs work, were reversing the natural order of things: they were making themselves the slaves of the dogs, instead of using the dogs as willing slaves to the men. Still, we never could go as far as Ralph Payne-Gallwey, and say that the guns were taking a mean advantage over the birds that were foolish enough to lie to the dogs. As will be seen in the correspondence that appeared in *Shooting and Land and Water* in 1888, we always held that it required a more accomplished shot to make a bag and a good record over dogs the season through than to make an equally good record behind the butts at driven game. The reason we think so is that the walking on all kinds of ground at all sorts of steep angles and broken foothold takes so much out of the shooter (especially if he is also hunting dogs for himself, as we did); so that to maintain the same form throughout a day tries and tires the nerves, even if it does not the muscles.

We have known seventeen brace of partridges killed over dogs in Shropshire within the last ten years by one gun in a middle of November day. We have ourselves killed over dogs six brace of partridges in a bare fallow of twelve acres in December. But nobody can repeat performances like this at will, and they may not come once in one hundred times of going out. The other ninety-nine times you are driving birds off your estate so persistently as to reduce the stock, and dog-breaking and shooting over dogs in such circumstances is very expensive indeed when measured in results of the bag.

We do not think it possible to keep up a head of partridges on any estate so small as 5,000 acres, if very much dog-breaking is carried on upon it in the spring. The same driving off of the game is still more easily accomplished in the shooting season. For the sake of the bag, therefore, big days are the truest economy of game-keeping and of shooting. We think that the generation that denied the big

days the title of sport, because of the necessity of driving the game for them, has died out, or learnt better. The true sport of shooting over dogs is only to be found where it is impossible to get the game without canine assistance. It is a pitiful sight to see dogs trying to do their duty when grouse have rolled up in great clouds before setters or pointers get within a quarter of a mile of them, and it is even more hard on the dogs when they arrive at the scented ground and false point all over it. But if this is pitiful for the dogs, we know of no more distressing "sport" for the men than when they find themselves, with guns, gillies, and ponies, all ready on a 20,000 acre moor on 12th August, and the grouse scarce and lying like stones, and only one necessity to ensure enjoyment absent—that is, good dogs. In such a case, and there are many such moors in Scotland, the man comes to regard good dogs in an altogether different light than will be the case when the same animals are struggling with difficulties—with the false scents of flown birds. In the former case they become his fast, inseparable, and indispensable friends; in the latter, he tolerates them because they are his friends.

The literary advocates of two lines of guns in covert shooting do not seem to have *taught* much. What they have said is all right, no doubt, but it has been much misread. Thus we frequently see eight guns crowded into a hundred yards, with some of them forty or fifty yards behind the others, the nearest guns being no more than thirty yards from the rise of the birds. This is not making the most of the game, and although the birds are actually sent over the guns on this plan, there is not so much skill required as there is when walking with the beaters and shooting all that rises. When, however, the guns are separated from the rise by one hundred or two hundred yards; from each other by seventy or eighty yards: the second line, perhaps, one hundred yards behind the first, taking up positions that, extended forward, would bring each gun equal distance between two forward guns: when this can be arranged there is skill and sport in killing, especially if the birds happen to be going home

wn wind, and have come over high trees to the ns.

There is a story of a great shooting Duke, who, when entertaining Royalty, had put a notoriously bad shot in a low in front of the guest of the day. This was done to ke the birds rise. Soon, however, it became apparent t Royalty was getting no shooting. Investigation proved t the notoriously bad shot had, rather than be disgraced ore such company, undertaken the task of loader to his n ; that the latter was pulling down the pheasants in rare le, and leaving none at all for the Royal shooter. The ce in question is, we know, particularly fond of the back e, and prefers a dozen good kills, in such a situation, to v kicked up just inside the cover and fluttering over him. s shows the best spirit of the times, and yet there are ers who complain that, although they, poor commoners, uld be "no sportsmen" to kill the forward birds when lking with the beaters, yet the dukes and great men ward never omit a chance, low or high, and their utations do not suffer in consequence. If we grant the ts, as stated, we cannot but endorse the protest.

CHAPTER XIV.

HEAT OF GUN BARRELS AND THE EFFECTS UPON THEM OF VARIOUS POWDERS.

IN the foregoing chapter Lord Walsingham speaks of the difference in the heating of two kinds of barrels, one being Whitworth compressed steel, and the other English Damascus iron. It is possible that two kinds of iron, of which Damascus is made, set up more or less electricity, as in the thermopile, and if heat was converted thereby to some extent into electricity, there would be, at once, a reason why the barrels should be kept cooler than when homogeneous steel is used.

The thermopile was first applied to gunnery by Mr. Borland of the E.C. Powder Company, who measured the heat given by caps by its aid. To him we are indebted for an idea. When we read his description of his application of the thermopile it occurred to us that we might satisfactorily apply a like test to the heat-giving qualities of various powders.

The thermopile is described as follows :—

“ . . . to a surface composed of 140 pieces of metals of two different kinds, seventy of one sort are joined to seventy of the other. Heat upon these couples sets up electricity, and it is by means of this electricity that the proportion of heat of one flash to that of another is ascertained. This electricity is conveyed by wires to a pendulum (a coil) suspended between the negative and positive poles of a horseshoe magnet, the pendulum, or coil, being free to turn in either direction, and the electric current, according to its strength makes it turn little or much. This pendulum has a reflector fitted to it, in order to reflect the light of a lamp on to a scale : as the light runs up and down the scale we read off the measurements marked upon it. These measurements do not represent degrees of heat F. or C., but only degrees of the thermopile, which multiply as the heat

plied increases, but are not to be translated into degrees of heat E. or C. This instrument is so delicate that the near approach of the little finger sends up the registering light instantly."

Every game shooter has, we imagine, felt the extraordinary discomfort of guns too hot to hold. In these days of driving game even the employment of three guns does not always permit the barrels to get cool enough to handle, and it has happened to most people as to Sir Frederick Milbank, when in '72, he killed his great bag of 728 grouse in eight drives, using three guns, that barrels have got too hot to hold except at the trigger guard. Sir Frederick on this notable occasion on Wemmergill Moors was only using $2\frac{1}{2}$ drams of black powder and $\frac{1}{4}$ oz. No. 6 shot—a load that should have permitted the barrels to cool if anything would. There is not, however, any powder or any load that can be rapidly fired a great number of times without making the left hand burn in a manner that does not improve the shooting. But there are very great varieties of powders on the market now, and the sportsman has such a choice that he must indeed be hard to please if none of them suit him. It has been said for years, and taken for granted, that a nitro-glycerine powder is certain to give out more heat than a pure nitro powder, because the combustion is more perfect and the oxygen more plentiful. Perhaps when this was said it was not taken into account that the less complete the combustion the more combustion there must be to evolve an equal volume of hot gas. However that may be, we have lately satisfied ourselves that between the old nitro powder—say, E.C. No. 2—and Ballistite, the heating of the barrels was greater with the former and less with the latter; this is contrary to received opinion—formed, we suppose, on a knowledge of the smaller degree of heat of a flame when oxygen is deficient, and the greater heat of the same flame when it is added. Thus, when a stream of oxygen is ejected on to a V-shaped gas flame, the latter is immediately lessened in size and increased in brilliancy and in heat.

The actions of gunpowders are very complex. How far they are similar to the application of a spark to a mixture

of oxygen and hydrogen it is not easy to say. We know that there is a great deal of oxygen and hydrogen in the composition of all of them. It has been said of powders that if heat is less the permanent gas must be more to ensure the same velocity to the shot. But this does not follow as a matter of course; time has so much to say to all questions of gunnery. For instance, if we mix oxygen and hydrogen in a vessel and apply an electric light to them they first expand, as flame, and then turn into a small drop of water. If we regard our gunpowder for the moment as nothing more than fixed oxygen and hydrogen it will be apparent that if it is ignited slowly oxygen and hydrogen may be still set free after that first freed has turned to water. If this were so we should expect such a charge to heat the barrel much more than necessary, because some of the heat-given power would cease to have expansive force, and would become steam while the shot were still in the barrel, and more powder would, therefore, have to be used up to make up for this loss of economy. That something of this kind goes on we know, and it accounts for the difference of power of gun-cotton when it is detonated, and, on the other hand, when it is burned in the ordinary way by means of ignition from flame. We have made these remarks in order to suggest that it does not follow that the hottest flame necessarily imparts the greatest heat to the barrels, and in order, with a good grace, to disclaim any intention to put forward our results as measurements of the heat of the differing flames from various powders. We have thought a good deal about the matter, and we cannot believe that the heat of the flame itself is material to the game shooter, but we do think that the heat imparted to the barrels by the various powders is of material consequence. We have, therefore, taken comparative heat tests of the barrels immediately after a double discharge in each case, on the thermopile, and we have allowed the barrels to cool to the normal heat of the atmosphere, by the same test, in every case before firing again.

We stated, when we first tried the New E.C. No. 3 powder, that, as compared with E.C. No. 2, besides being smokeless,

t had the advantage of not heating the barrels ; after trial we thought that ten shots of the old sort were about equal to thirty shots of the new for heating the barrels. The thermopile makes the difference less than that ; but then we have to remember that the whole of the heat absorbed by the barrels is never retained until the next shot is fired, because the breech has to be opened and the cases ejected, which of itself passes a current of cool air through the barrels. The Old E.C. gives 190 degrees of heat on the thermopile after a double shot, the New E.C. only 100. Suppose we imagine (for it is only a guess), that the opening of the gun loses 50 degrees of the thermopile in each case ; then the remaining heat from each double shot would be 140 for the Old E.C., and 50 for the New E.C. If this were so the equal heating of the gun between ten shots and thirty shots would be nearly exactly confirmed. If there were no loss the difference would be as between ten shots and nineteen shots according to the thermopile. There must, however, be some loss from each, and more by reason of the lapse of time in firing nineteen shots than in firing ten shots as quickly as possible. In our opinion the thermopile has confirmed our own sense of touch, and proved to us that when we said thirty shots of the new powder did not heat the gun more than ten of the old, we were not more than one or two cartridges wrong at the outside.

The results on a hot day in August or September may be different. Much less heat would be given up by the opened barrels in similar time, and it might be that this would serve to bring the two powders nearer together. We speak of a trial by hand made in December, 1897, on a cool day with a strong wind blowing. But loss of heat there must be at all times, when the gun is opened, and therefore the differences of thermopile degrees of heat, obtained from double shots, are not to be taken as equivalent in ratio to the actual differences of remaining heat in the barrels when twenty or thirty shots have been fired ; fired, be it noted, with more or less interval between each shot, and more or less loss by opening the gun. To get at a comparison, judging by our own hand test and its

comparison with the thermopile readings, we should deduct 50 degrees from each reading, and then multiply by the number of shots fired. Thus, for example, if 140 is reduced by 50, it leaves 90 ; if 100 is reduced, it leaves 50, and then if thirty shots of the latter forms the limit of bearable heat, 16 or 17 will do so for the former.

Average measurements of remaining heat in the metal of the barrels taken by the thermopile after each right and left :—

Powders tried.						Thermopile Measurements.
Normal	...	...	...	...	...	113
Ballistite	...	...	...	...	...	120
Cannonite (coarse)	...	...	...	...	...	100
Walsrode	...	...	...	...	...	135
Cannonite (fine)	...	...	...	...	...	100
Amberite	...	...	...	...	...	110
New E.C. (No. 3)	...	...	...	...	...	100
Old E.C. (No. 2)	...	...	...	...	...	190

CHAPTER XV.

CAP-TESTING.

MR. W. D. BORLAND, OF THE E.C. COMPANY.

MR. BORLAND is unquestionably the leader of scientific investigation of the difficult problem of the proper ignition of nitro-powders. It was, therefore, a happy idea of the Gunmakers' Association in 1897 to ask him to give a lecture on a subject of such great importance to shooters. Since that lecture was delivered we have followed Mr. Borland in the methods of test for caps that he has devised, and we have no hesitation in saying that the various instruments he uses will settle, if they have not already determined, the qualities that are to be aimed at in the manufacture of caps. We think that before making any remarks on our own trials of various makes of caps, it will be desirable to reproduce the greater portion of Mr. Borland's lecture, which shows how caps of similar character may vary under the different character of blow given by the striker. As everything in nitro-powders depends upon the manner of ignition of the powder, we believe that shooters will be very interested to see what variations of ignition are possible, even from the same material.

We do not for a moment suppose that sportsmen will ever take a practical part in the testing of caps or in discovering the best material from which to make them. It is enough for the shooter to know that all this trouble is taken for him, and to be aware that when, sometimes, he gets an unpleasant jar upon firing his gun, it does not follow, as a matter of course, that the powder is wrong, or that an overload has been used. The variation in the illustrations below, taken from Mr. Borland's photographs of the flashes

of caps, five upon each plate, are quite enough to prove this to anyone who has the slightest knowledge of the peculiarities of nitro-powders.

The subject matter of the lecture was as follows :—

“The problem of the proper ignition of nitro-explosives in small arm ammunition is one of the utmost importance to all who are



MR. W. D. BORLAND.

any way connected with the preparation and use of ammunition. It is one which has engaged the attention of experimentalists and manufacturers for many years past, and in which, owing to the varied requirements of modern powders, no little progress has been achieved during the last few years. The difficulties surrounding the investigation of this matter are by no means small, owing to the difficulties of placing in the interior of small-arm cartridges suitable measuring or recording apparatus, and we are all aware that even the cutting of a small hole in a cartridge for crusher work is very often sufficient to

poset accuracy in velocity estimations. Hence it is that in studying such a subject as that of the ignition of nitro-powders in small-arm cartridges one has to employ a more or less inductive or analytical method of research.

"The ideal ignition of nitro-explosives may be generally laid down in the following lines as the means whereby the highest possible velocity together with the lowest possible pressures are obtained, combined with regularity and freedom from undue sensitiveness to variations in mechanical conditions of the exploding mechanism. This ideal is, like all other ideals, difficult of attainment, but I wish in the most emphatic manner possible to bear my testimony to the improvement which various manufacturers have made and are still making, in face of difficulties of experimenting with unpleasant materials like cap composition; in face of the very small charges, viz., under 0.6 grains; in face of the mechanical difficulties, such as strength of metal and adjustment of weight of charge; and, perhaps most of all, in face of the very varied requirements and demands made upon them from time to time consequent on the introduction of new explosives.

"The final court of appeal in determining the suitability of an ignition for any particular explosive is, of course, actual practice in the field, or elaborate determinations of velocities, pressures, and so forth, but this is naturally cumbersome, and only shows whether a cap is suitable or unsuitable. It does not indicate how failure is to be avoided and best results achieved, as these are dependent upon a variety of conditions.

"The following points have to be taken into account:—Total energy of explosion of the cap, size and shape of flame, duration of flame, temperature of flame. And, further, there is the sensitiveness of the cap to altered conditions of striker.

"The earliest cap test appears to be the method of placing the cap at one end of a tube and receiving from the other end the flash on a paper. The result obtained is due partly to charring effect and partly to the deposition of residue from the cap composition, and the test is heretofore only to be regarded as one suitable for the comparison of various caps of the same make one with the other for regularity. I believe the next cap test was one which was devised at Stowmarket about 1882, and was described to Mr. Walsh. It consisted in inserting a cartridge case in the chamber of a gun and then dropping down the muzzle a tube with a number of threads of guncotton placed across it about one inch apart; on exploding the cap the number of strands of guncotton burnt showed how far the flame had acted.

"In 1891 I began to give attention to the matter of cap testing in a serious and scientific manner, and early in 1892 I described an

apparatus which enabled one to measure for the first time in a really accurate manner the energy produced by the explosion of percussion caps, and also to give other information of a valuable nature, such as the effect of strength and direction of blow, the effect of shape of striker, and the time elapsing between delivery of blow on striker and development of a flame of any specified length.

"The apparatus in its most developed form is to be found described in English patent No. 12546 (1892), and when I devised this test I was perfectly aware that the determination of the energy of explosion produced by a cap was not an infallible guide to the fitness of any cap to any specific purpose, and my experience during the last five years of cap testing in conjunction with ballistic testing has shown me that whilst the energy test is valuable in determining regularity or otherwise of a make of caps it only provides an approximate guide in comparing different makes.

"If the ignition of nitro-powders were simply a matter of energy, then why not reduce the cap flame to its extreme minimum and make up the energy by an increase in the charge of powder? Therefore, I wish to deprecate too much importance being attached to any method of cap testing which only has reference to determination of energy, whether such testing is performed by means of apparatus such as I have been describing, or whether by means of the more cumbersome modification of my original test which has lately been adopted by the *Field*.

"All nitro-powders require for the full development of their potential force that the greatest possible proportion of the whole amount of charge should explode under a fairly considerable pressure, possibly about one ton to the square inch, and it is the function of the cap to get this pressure up as quickly as possible. If the cap flame be insufficiently energetic, a certain proportion of the powder charge is probably burnt under conditions unsuitable for the most perfect development of its power: if the cap flame be too energetic in its action, then too high pressures are produced and patterns suffer. To hit the happy mean it is evident that only a study of characteristic cap explosions in conjunction with ballistic trials can suffice, and I venture to think that the methods I have already made known and those that I am about to set forth put a power into the hands of investigators which they have never before possessed.

"There is no difficulty in getting a very good idea of the characteristic flame produced by percussion caps by cutting the case away, and exploding the cap in a dark room; but it is not easy to keep in one's mind the result, say, of a thousand or so flames. On the other hand, I believe that for some reason or other all attempts at photographic representation have not been very happy, and this I can

quite understand, as many of my original endeavours to photograph cap flames were totally unsuccessful, and it was only at last by a combination of very sensitive plates and very intense lenses that I have been able to bring this method of research into the realm of practical everyday work.

"As regards lenses, what is wanted is great intensity, and the aperture should not be less than half the equivalent focus, that is to say, that a lense working, as photographers express it, at about F/2, is suitable for practically all except the excessively feeble cap flames of some six or seven years ago. As regards sensitive plates, it is advisable to obtain these from a manufacturer who uses some standard system of speeding, such as Hurter and Driffeld's method; and I think it is only fair to state that in all this research I have found the manufactures of Messrs. Cadett and Neall to be absolutely irreproachable both as regards uniformity and high speed. As regards development, ferrous oxalate solution is undoubtedly most satisfactory, but where time is an object metol-quinol may be satisfactorily employed. I have also obtained most excellent results with a developer made by the plate-makers above mentioned. Whatever be the means of development adopted, it should be adhered to through thick and thin, otherwise results will be useless for comparison.

"As regards camera, the simplest possible form is the best, and I have devised a plate-holder which is fitted with a travelling motion, so that various portions of the plate can be successively advanced to the centre of field, and so a number of consecutive records can be taken on the same plate. As regards exploding mechanism, the original cap tester is perfectly suitable, but must be used in a dark room. To avoid this I have devised an apparatus in the use of which no dark room is required except during development, and I shall describe this on some future occasion."

The following photographs were then thrown upon the screen five times the diameter that we give them



"No. 1 is a small cap much in use in 1892-1894. It was only fairly satisfactory."

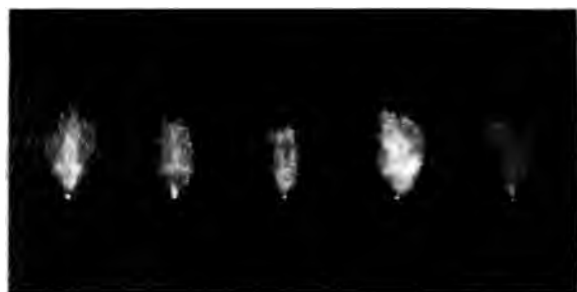
here. Thus they represented the actual size of the flame, which is five times as large as our pictures.



"No. 2 is the same cap under different conditions of weight used for exploding it.



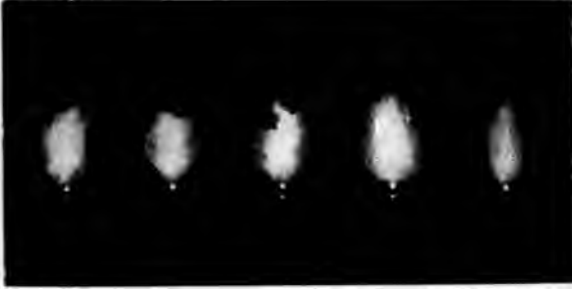
"No. 3 is a large cap of the same date as Nos. 1 and 2.
"Nos. 1, 2, and 3 are now obsolete : they were **certainly** capable of improvement.



"No. 4 is a quick-burning small cap of the same date as preceding. It produced rather higher chamber pressures than 1, 2, or 3.

"The total amount of heat generated by the explosion of a cap charge must of necessity be very small, owing to the small amount of

rial producing it, and it is doubtful whether any attempt to n absolute measurements can result in success, at least without



"No. 5 is a small cap of different make still on the market; it is very regular and satisfactory on the whole. This was exploded by 2 oz. weight falling twelve inches.



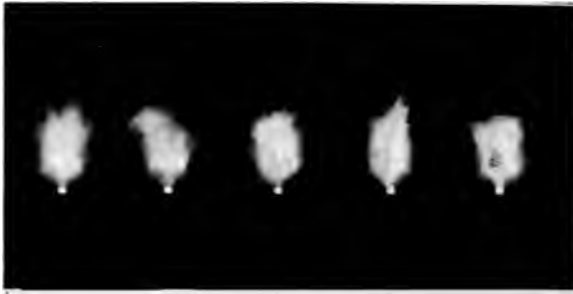
"No. 6 is the same issue as No. 5, but with a stronger blow, 2 oz. by twenty inches.



"No. 7 is a well-known foreign cap with long-legged anvil, the effect of which is to shorten and broaden the flame. The effective area of flash hole in this make of cap is small, and whilst the composition is somewhat slow in its rate of combustion, yet the confinement in the cap chamber is sufficient to provide for perfect combustion.

complication as must preclude a test of this sort, from more occasional use. On the other hand, it is possible by the use of a

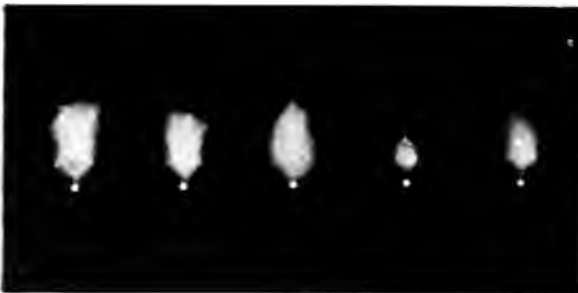
thermopile, on the face of which the cap frame is received, to obtain very excellent comparative tests, the current produced by the thermo-



"No. 8 marks a new departure in English caps. This is an excellent small cap; explosion was effected by a 2 oz. weight falling twenty inches.



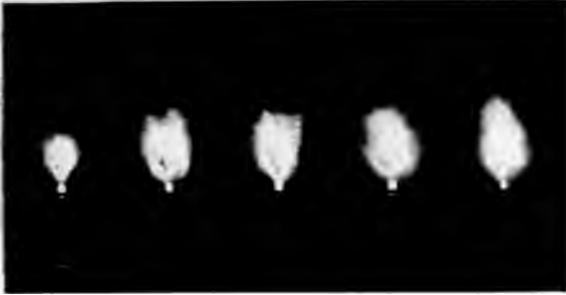
"No. 9 is the same issue as No. 8, but exploded by a 2 oz. weight falling twelve inches. The effect of a blow just on the lower limit is very marked.



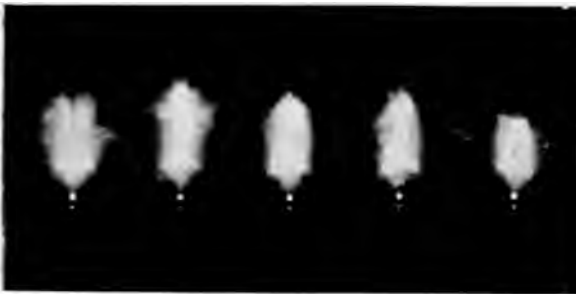
"No. 10 is the same as 8 and 9, but the exploding blow was not a lively one, viz., 24 oz., falling two inches.

pile being preferably measured by a reflecting galvanometer used ballistically. The galvanometer actually employed is Major Holde

ation of the D'Arsonval instrument. As regards thermopile, the simplest form to use is the old-fashioned one, consisting of about



"No. 11 is the same cap as 8, 9, and 10, and the same blow as No. 8, but the striker was slightly pointed.



"No. 12 is a large cap of recent issue, 2 oz. by 20-inch blow.



"No. 14 same as 12. Pointed striker.

bismuth-antimony couples, and with a face of about one and one-half inches square, which is maintained at a constant distance from

the flash hole throughout the series of experiments. Experiments have also been made with thermo-junctions consisting of platinum.



" No. 15 blow reduced to bottom limit, 2 c. z. by twelve inches.
Same as 12, 14, and 16.
No. 15A. Series 15 repeated.



" No. 16 same as 12, 14, 15. Cases heated about 100 deg. C. for half-hour. Five misfires out of ten. The deteriorating effect of heating this particular cap is very marked.



" No. 17 same as 12, 14, 15, 15A, 16. 24 oz. weight fall increased from two to three inches. As blow increased, flame became worse.

platinum-rhodium and platinum, platinum-iridium: but so far with less success than with the older form of antimony-bismuth series.

receiving surface is so much larger. But I expect to be
vercome the difficulties at present attendant on the use of the
platinum-rhodium junctions by receiving the cap flame in a



" No. 18 same as preceding, but all exploded with a blow of
24 oz., falling three inches.



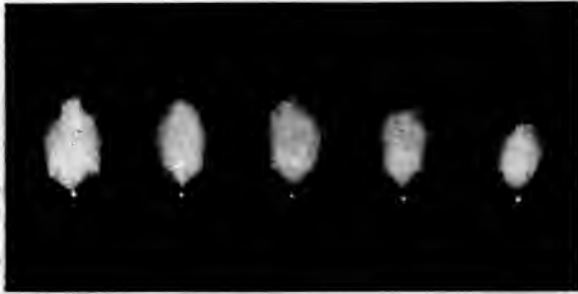
" No. 19 a special large energy cap producing high velocities
and low pressures, 2 oz. by 12-inch blow.



" No. 20 same as 19, but blow 2 oz. by 20-inches.

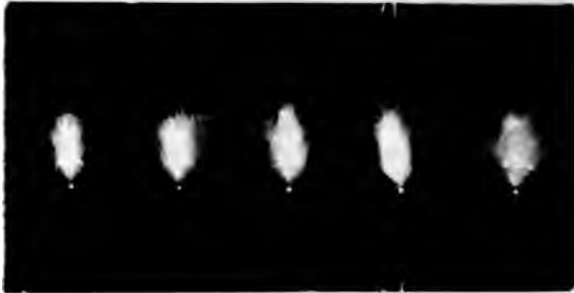
essel of non-conducting material in which the thermo-junction
Still, whatever details I may ultimately arrive at, enough

has been done to show that there is an enormous difference between the heating effect produced by various makes of caps, and that

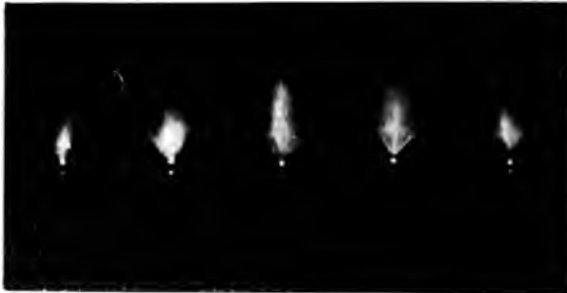


" No. 21 same as 19 and 20, blow 24 oz. by 3-inch. This cap appears to be but little sensitive to strength of blow and is quite irreproachable.

" The following ten caps are used for concentrated powder :



" No. 22 for Walsrode, blow 2 oz. by 12-inches.



" No. 22A for Walsrode, blow 2 oz. by 20-inches.

question of heating effect is a most important one taken in conjunction with the points already referred to.

is not safe to dogmatise respecting the behaviour of explosives, as there are so many conditions of influence, but at present we have to say that for all practical purposes the fitness or otherwise



" No. 23 for Ballistite.



" No. 23A for Cordite (since improved upon).



" No. 24 for Poudre J. English make.

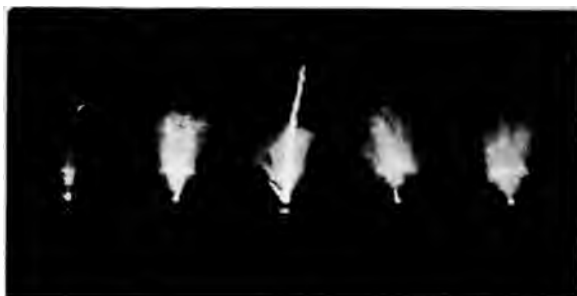
ignition proposed for nitro-powders can be worked for on the suggested, and that the four conditions, viz., energy, heating

effect, shape, and size of flame, and, above all, duration of flame, &c. — practically all that requires to be determined.

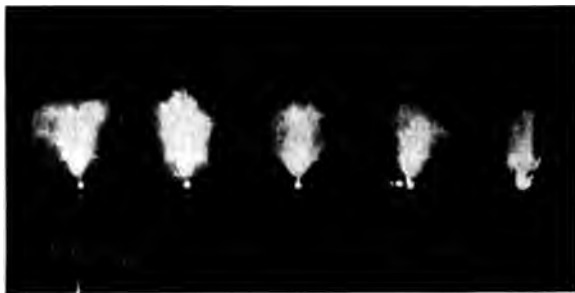
“ May I add the following general inferences and suggestions :—



“ No. 24A for Poudre J. Foreign make.



“ No. 25 for Cannonite, blow 2 oz. by 12-inches.



“ No. 25A for Cannonite, blow 2 oz. by 20-inches.

“(1) It is not advisable on any single test to accept or reject any particular variety of ignition, as experience shows that the following

to be taken into account :—Energy, duration, heating effect, and size of flame.

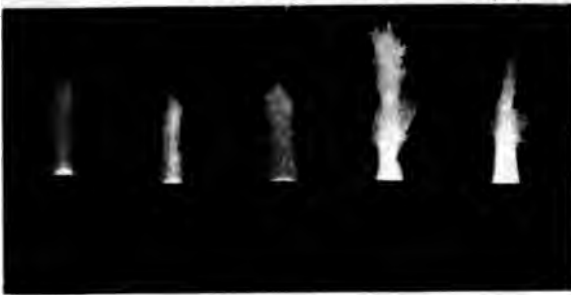


"No. 26 for Cannonite different makes than 25 and 25A, blow 2 oz. by 20-inches.



"No. 27 for Cannonite same make as 26, blow 2 oz. by 12-inches.

"With 26 and 27, contrary to general experience, the breaking-up of composition and expulsion of same in burning fragments is more readily arrived at with a weak than with a strong blow.



"No. 28 shows the effect obtained by photographing the flame, which projects beyond the case, using the case of full length. A series of five English caps of various issues. Total flame under these conditions varies from 2½ inches to 6 inches, measured from flash hole.

That any considerable departure from standard *strength of*

blow and shape of striker will induce difficulties. A blow equivalent to that produced by a 2 oz. weight falling fifteen inches is a good, ~~small~~ one, and the striker advised by case-makers is highly satisfactory.

"(3) That exposure to high temperature such as might easily obtain if a cartridge bag be carelessly thrown on a steam radiator, ~~for~~ example, will probably result in misfires and irregular action. A case of this sort actually occurred to my knowledge.



"No. 29 similar to 28, but cases of foreign origin.



"No. 30 represents the flames produced by five characteristic issues of caps. In four out of the five the ballistics follow the flames, viz., the largest flame gave with three powders examined highest velocities and pressures, and so on as regards the other three. But the fifth cap produced the highest velocity with the lowest pressure, and this led to the investigation of the duration.

"(4) That it is unwise to load non-concentrated powders in cases made for concentrated powders. This I have also come across. ~~the~~ idea to reduce recoil and pressures being certainly carried out, but at the expense of velocities.

"(5) That in the proving of guns the effect of different caps may result in variations in pressure amounting to fully fifty per cent.

"(6) That, considering the known effects produced by different

caps when the whole charge is under 0.6 grains, the practice of timing is wholly to be reprobated unless accompanied by careful and elaborate determinations of pressures and velocities.

-- There is one reservation in connection with the experiments I have made to be borne in mind, viz., that in conditions of actual use percussion caps are fired under conditions of confinement, and this may, to some extent, affect the deductions to be drawn from the above. This, as I hinted at the beginning, is one of the difficulties of the research. Further, there is undoubtedly a difference in the actinic quality of different flames. This, however, does not affect question of regularity of flame or regularity of same.

-- I believe that the question of duration of flames in the ignition of nitro-powders is one which has not received the attention it deserves: so far as I have gone it seems to be desirable for the cap to produce its flame in a *progressive* manner, to produce in this way a *high energy* and a high *heating effect*."

Following up Mr. Borland's experiments with cap testers, we have observed that there is a distinct difference of colour in the flashes of caps even from the same batch, but this may not affect the ignition of powder as much as appearances would indicate. It is possible, on the contrary, that the flame may be affected in colour by its quick or slow mingling with the oxygen of the air. In the loaded cartridge case there is very little air between the grains of powder, perhaps not enough to effect a change of heat between the flame of two caps of the same batch. We have not observed that the difference of shape of striker, nor the differences of weight of blow, has had much effect in changing the character of the flame; it is possible that Mr. Borland's experiments have already done good service, and that better caps are now issued than those with which his experiments were conducted. But if we have not found that the shape of the striker and character of the blow has had much effect, there has been an enormous difference from the same striker and the same weight of blow produced by caps out of the same batch: the powder-makers have to suffer for these differences, for it has not yet been discovered by them how to make their powders independent of the difference of ignition—a quality that black powder always had, and in which it is even yet streets in front of nitro-powders.

In one thing we are assured Mr. Borland is absolutely right. He says, and says very rightly, that you cannot depend upon any one test of caps. Thus we may say that there is a Belgian case on the market that gives very low energy, very small photographic brilliancy, and yet much greater heat than any other caps we have tested. Now we are all aware of the value of heat in the ignition of nitrate powders. It is not sufficient, for instance, to put them to the flame of the cap, they must be near the base of the flame, in order to be ignited by it in quicker time than the flame of the early ignited grains of powder will ignite them. Heat, however, in a cap is only one of many qualities after all.

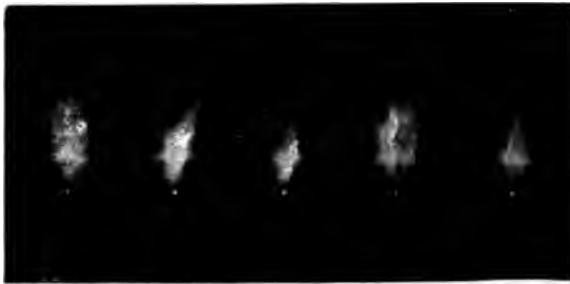
We do not think that Mr. Borland's plans for measuring the various qualities of caps can be much improved upon; at any rate, we have been content to follow them without attempting improvements. In the lecture previously given he has thoroughly described the photographing of the cap flames. The test for heat is there explained also, but not in such a way as to be understood by those who do not know the instrument he has adapted to the work. We may say, therefore, that a cap flame is, at a stated distance off, shot on to a surface composed of 140 pieces of metals of two different kinds—seventy of one sort are joined to seventy of the other. Heat upon these couples sets up electricity, and it is by means of this electricity that the proportion of heat of one flash to that of another is ascertained. This electricity is conveyed by wires to a pendulum suspended between the negative and positive poles of a horseshoe magnet, the pendulum being free to turn in either direction, and the electric current, according to its strength, makes it turn little or much. This pendulum has a reflector fitted to it, in order to reflect the light of a lamp on a scale; as the light runs up and down the scale we read off the measurements marked upon it. These measurements do not represent degrees of heat F. or C. but only degrees of the thermopile, which multiply as the heat applied increases, but are not to be translated into degrees of heat F. or C. This instrument is so d

he near approach of the little finger sends up the ring light instantly.

Then Mr. Borland's energy measure for caps is unique, such as it measures total energy, and there is no loss of the flame of the cap mixing with air. This instrument we have used in various ways; first as a cutter Eley's lead-crusher gauges; second by crushing the



The above is a photograph one-fifth actual size of the flames of five Eley small caps, fired consecutively by a blow 2 oz., falling 13 inches.



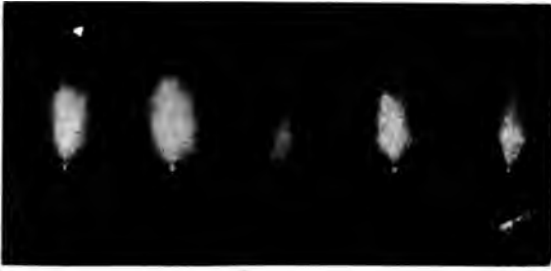
The above is a photograph one-fifth actual size of the flames of five Kynoch caps, fired consecutively by a blow 2 oz., falling 13 inches.

as they are crushed by the piston-rods in taking all barrel pressures. So truly are these instruments and so absolutely do they expel the air, that there is no sound when the cap is exploded in them, and, as we said before, their total energy is expended in driving on on to the lead crushers.

Having said this much, we propose to give a few examples of the results obtained by us in the three methods of test indicated above. We have long been an amateur photographer, but we never dreamt that our experience in this direction would come in useful and assist us in our knowledge of gunnery. We should say that the examples



The above is a photograph one-fifth actual size of the flames of five Winchester caps, fired consecutively by a blow 2 oz., falling 13 inches.



The above is a photograph one-fifth actual size of the flames of five Joyce caps, fired consecutively by a blow 2 oz., falling 13 inches.

given here are not in any way selected, but were the first of each batch of caps tried by us.

We do not think, from examination of other photographs made, that an extension of the series would give any better indication.

The next test is, to us, a very interesting one, that of testing the total energy of the cap by means of a cutting tool on lead crushers; it shows the energy given of the Belgian case against that of the Eley medium cap. The Eley lead crushers used were very little indented by the Belgian cap (see Figs. 1 and 2), but the Eley Medium cap well-nigh cut in half the lead crusher (see Fig. 3).

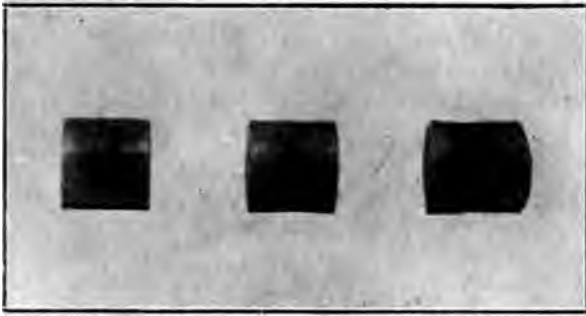


FIG. 1.

FIG. 2.

FIG. 3.

Fig. 1 cut $\cdot 05$ inch deep.

Fig. 2 cut $\cdot 06$ inch deep.

Fig. 3 cut $\cdot 18$ inch deep.

These results were confirmed by a different trial—that of compression of the $\cdot 323$ lead-crusher gauges.

The Belgian cap compressed the lead from $\cdot 500$ inches to $\cdot 485$ inches, representing a pressure according to Eley's tables of $\cdot 08570$ of a ton, whereas the Eley medium cap compressed the lead to $\cdot 410$, representing a pressure of $\cdot 171$ of a ton. Yet we shall make it clear later that the Eley cap gave much less heat than the Belgian in spite of its much greater energy. It may be thought that such energies are impossible from a cap, and we are not at all sure, as we have often said, that lead crushers give anything more than comparative results, and we altogether doubt whether actual measurements of pressures of blows are possible. As it happens that we only want comparative results, the failure to obtain absolute measurement is not so important as it may look at first sight.

The following are the results of heat tests on the thermopile of the flame of various caps, taken under exactly similar circumstances :—

				Degrees on the Thermophile Scale.			
The Belgian Cap	...	...	250	...	300	...	310
U. M. C.	...	...	160	...	155	...	160
Eley Medium	...	...	187	...	190	...	150
Eley Small Cap (nitro)	...	...	130	...	120	...	130
Eley's Cannonite	...	...	150	...	160	...	200
U. S. Co. Climax	...	...	110	...	83	...	105
Kynoch Small Cap	...	...	140	...	138	...	138
Kynoch Large Cap	...	...	170	...	174	...	176
Joyce	...	...	110	...	150	...	145

As we have said of the crusher-gauge tests, so we say of these heat tests, that they are very far from measuring actual degrees of heat of the flame, but they may be taken as a safe comparative guide, nevertheless, and a record of 80 on the scale may be safely taken to record just half the heat as a record of 160 degs. The record of actual heat imparted between 83 degrees, which is the lowest, and 310, which is the highest, is nearly four times as much for one as the other, and yet this cannot represent anything like the real variation of the heat-giving natures of the different compositions, for the Belgian cap, as we have already explained, gives very low pressures, or energies, and its flame is so little brilliant as to be exceedingly difficult to photograph, and it does not appear amongst the photographs above, and yet the heat given by this flame exceeds all the rest very greatly. If we take its heat to be double that of the average caps, and its energy to be one-third, we may assume that an equal energy would impart to the powder six times the heat of the average cap.

CHAPTER XVI.

SHOT-GUN PATTERNS.

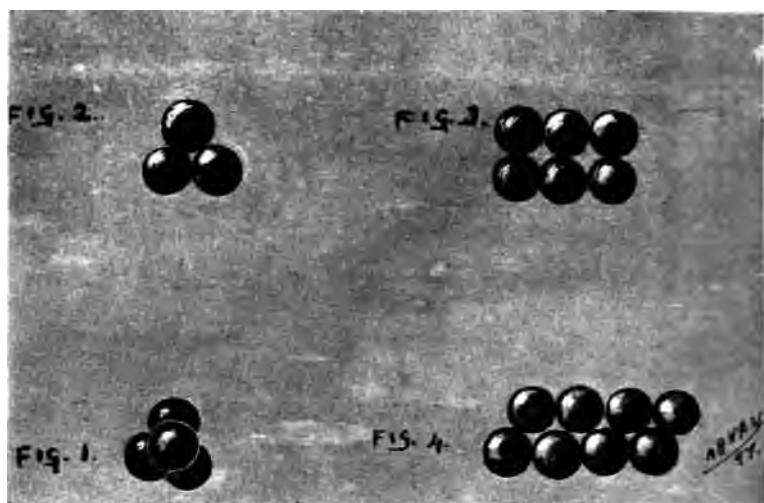
MR. R. W. S. GRIFFITH, OF THE SCHULTZE COMPANY.

THE patterns of Shot-Guns have for ten years or so formed a very interesting study for Mr. W. R. S. Griffith, the chemist and managing director of the Schultze Powder Company. No man has as frequently or as persistently endeavoured to bring into something like order the irregular scattering of the shot pellets from the muzzle of a scatter gun. Before we come to Mr. Griffith's views—the result of much experiment—we have a word or two to say on the theory of gun patterns. Why should shot pellets scatter as they do from a straight barrel? Simple as the question is, we have never seen it properly answered in print. It is an obscure problem, untested by actual measurement, perhaps, but all the same it seems to be answerable by the laws of simple mechanics.

In a cartridge case it is obvious that, however evenly one layer of shot rests upon the powder wad, the shot pellets above these fall into the hollows created by three spheres, touching each other at some points of their surface. Figs. 2 and 4 show this, and it will be found impossible in a cartridge case to avoid something of this formation of the pellets; that is to say, they will never lie as represented in Fig. 3, nor can they be made to do so. In going up the barrel the pressure from behind will preserve the formation of the mass, and until the muzzle is reached the walls of the barrel prevent spreading. But, the resistance coming from the front and the pressure from behind, the moment the pellets leave the barrel in a solid mass the underneath spheres are wedged between those in front, giving them a

lateral direction. If, for instance, we lay three marbles on a table-cloth and manage to lodge a fourth upon the top of them, then the slightest pressure from above sends the three supports in as many directions. See Fig. 1.

This is what must happen to the shot as they leave the barrel of a true cylinder. It must be remembered that when the first shot are out of the barrel, meeting the resistance of the air, those inside pressing upon them are still acquiring extra speed from the pressure behind. A lateral spread would therefore be the result of this wedging one between three. Each pellet is not merely subjected to the pressure



of one behind it if it were, the variation would probably be much greater than it is—but every pellet is probably influenced by at least three pellets in front and three others behind, except those that are in contact with the surface of the barrel or with the wadding. And all of these are behaving as wedges between the others. Luckily in various directions. Choke-boring seems to have been an accidental discovery. The results of it were known before the theory began to be talked about, and even now it is sometimes stated that the wedging of the shot induces them to stick to each other more or less. Others, including Mr. Griffith, believe that the direction of the shot is turned inwards by the choke, and this may be so, but it does not seem to us

sufficient to account for the remarkable results that can be obtained from this method of boring. We would rather attribute it to the early break up of the solid mass—to the break up within the barrel—so that the wedging process of the hinder shot, into the layer immediately in its front, no longer exists to any considerable extent. This theory is supported by the fact that to get the best results from a choked barrel the pellets must fit the barrel and the cartridge; that is, when enough are placed in the case just to cover the wad they do not roll about but fit the interior superficial area. When this is the case a violent jerk must be given when they are partially stayed by the choke of the gun, from which the first to receive it recover before those behind feel the effect. This, unquestionably, opens out spaces between the pellets. At the same time we can well believe that a tremendous variation of direction is given to some of them. But they are at that time not yet out of the barrel, and any that have received a very erratic impulse are controlled by the walls of the barrel and by the other pellets. For the majority of the pellets, however, there can be no further contact. They have been separated from each other within an inch or two of the muzzle, and leave it more or less in that formation. The principle is then to jostle them apart within the barrel, in order to prevent them from wedging each other outside of it. Of course there are other disturbing causes, such as the rush of gas past and through the shot the moment it is released from the barrel, for these gases travel much faster than the shot, but there is nothing to prove that they do harm, for it must be remembered that they surround the pellets in their flight, as well as, to some extent, passing between them. The broad fact, however, is that choke boring does keep the shot together.

The old method of boring was a simple opening out of the barrel in front of the fore-end; the new method is closing it in at the muzzle. The earlier method was proved to be infinitely in front of a true mathematical cylinder for its pattern, and the reason is obvious: it was a choke bore, but with a choke in a different place from that now recognised as correct.

Between advocates of the choke bores and cylinders there is still a great difference of opinion. "Each in its place" seems to us to be a wise middle view.

In January, 1887, we published in *Land and Water* a letter that gave rise to considerable speculation, and was probably the first cause of a series of measurements made by Mr. Griffith in the following spring.

This letter, the first to broach the subject of the cubic space covered by the moving shot, was followed up by Mr. Griffith with attempts to measure the stringing of the shot pellets. Of course, one measurement applied to three hundred separate objects, each taking a course of its own at varying velocities, has no pretensions to accuracy, but broadly, Mr. Griffith obtained this result, viz., that at 40 yards a killing cylindrical-shaped network of shot was sent up by a choke bore 30in. wide, 30in. through, and 9 yards long at 40 yards. A cylinder, on the contrary, sends up a cylindrical shaped network of pellets at the same distance of 48in. by 48in. by 12 yards long, the latter covering more than three times the space of the former. There are, of course, more chances for the game to escape altogether through the open spaces of the cylinder pattern, but as the game (even at sixty miles an hour) can barely fly through the shot while it is coming up; that is, not during the time between the first pellet and the last passing the line of the game, it is obvious that chances of hitting do not vary by the difference of the longitudinal space covered, but only by the difference of the section; or what is usually called the pattern, as seen on the whitewashed plate. We have it, therefore, that the chances of hitting, or aiming straight, increase as the cube measure, whereas the chances of killing when the aim is straight increase as the square of the diameter diminishes.

In the case instanced the chances of aiming straight or covering the game within the network of shot is 92 for the cylinder to 27 for the choke, whereas the chances of killing if the aim is straight is two and a half times better for the choke than for the cylinder. The above method of calculation only applies to crossing or quartering, or rapidly rising game of course.

At greater distances the proportion of chances of the choke bore over the cylinder of killing anything with the network of shot increases. At less distances the proportion comes together, because you do not require twelve shot pellets to kill a bird if four are enough. At 30 or 35 yards the cylinder is good enough to kill any British game when the aim is right, and the greater cubic space covered by the network of shot is at those distances, and nearer the gun, all in favour of the cylinder, without any drawbacks whatever.

At 30 yards the cylinder will cover 35in. by 35in. by 22ft.

The choke bore at the distance covers 24in. by 24in. by 18ft. Thus the space occupied by the cylindrical network of shot is, in the case of the cylinder's load, rather over two and a half times as much as that from the choke. That would represent the advantage at crossing fast game given by a cylinder to a shooter who was uncertain of his aim. But at 20 yards the value of the cylinder doubles again, for the choke-bore pattern is represented by 10in. by 10in. by 12ft. long, the cylinder by 20in. by 20in. and 15ft. long. This gives five times the advantage to the cylinder bore, at the distance, in such hands as are glad of the assistance, or in such shots as no man can accurately align.

Very little is known of the cause of "stringing" of the shot, and for practical purposes the variations of pace are all in favour of the shooter; so that we may ignore them, not only for that reason, but for a better one, viz., because this peculiarity has never lent itself to absolute measurement.

Following is what Mr. Griffith has to say about "pattern" or the position or marks of the shot when they have reached a flat surface at right angles with the line of fire:—

"‘Pattern’ is probably to the gunmaker the most important of the four chief points, attention to which results in perfect shooting from the gun, but to the powder-maker it occupies the fifth place. The first being a safety pressure in the barrel, the second the velocity of the shot, the third the rate of ignition and combustion in the barrel, and the fourth the gun recoil.

"The importance of ‘pattern’ arises in this way: The ideal shot would require one projectile only suited to the size of the game, but two things make this a general impossibility. One is the slight

variation in time occupied from the fall of the hammer to the arrival of the projectile at its mark, and this is the point which generally carries the abuse when a miss happens. The chief reason is, however, that of personal error, and this demands that the projectiles should be spread over an area corresponding at least to one-half of the personal error, magnified by the distance from the actual source of error, and the perfect pattern is one in which the pellets are equally distributed over this area."

An error of 20in. in aim would require a pattern of 40in. diameter at least to cover it.

"With some men a 30in. circle at 40 yards will cover all personal and other errors, others require a circle of 40in., and so on and happy

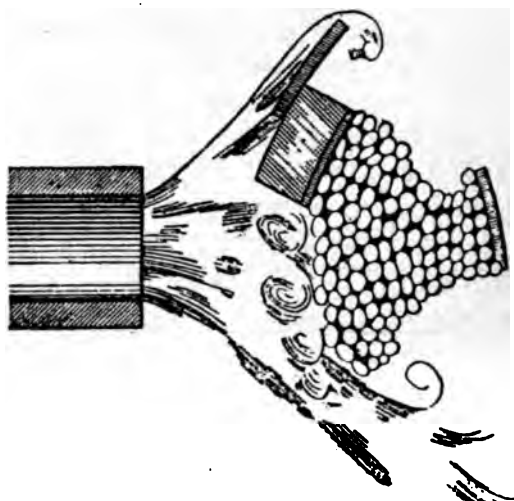


FIG. 5.

is the gunmaker who does not know among his customers the man who requires an area the size of the proverbial haystack to cover his error, and to ensure good shooting. From the economic side also a distribution of small pellets is desirable, that the game when killed may be in a fit state for the table.

"The charge of shot attains its highest velocity just inside the gun barrel, and according to the boring of the gun and other circumstances it begins on leaving the barrel to separate, each pellet taking a distinct line, more or less diverging at an angle from the muzzle.

"The line of angle of the pellets is fairly constant; a straight line drawn through the outer pellets of shot gives, for easy remembrance, the rule that from a choke gun 86 per cent. of the whole charge is included within a circle which is in inches of diameter of equal figure

to the yards from the muzzle. That is, with a choke gun at twenty yards from the muzzle, 86 per cent. of the pellets is found within a circle of twenty inches in diameter; at 40 yards, within a 40in. circle, and so on."

This would be a wide-shooting choke bore. Really a 24 in. circle contains all the killing area in a very high choke bore at 40 yards.

"With a cylinder gun 60 per cent. of the shot is included in the same comparative measurements. About one yard from the muzzle this divergence begins to show, more or less as the barrel is less or more choked. At two yards this is more evident still, and each succeeding yard shows the difference more and more distinctly. At ten yards the pattern is distinctly open, and one can begin to form some opinion of its ultimate appearance.

"Ideal conditions would give a circular pattern with the pellets equally distributed over the area, not necessarily, however, in my opinion, of simultaneous arrival. Such pattern would give, with a pattern of 220 at 40yds., 3 square inches or 4 circular inches to each pellet on a 30in. plate; while a pattern of 180 would give 5 circular inches, and a pattern of 130, 7 circular inches.

"Theoretically also, the wad between powder and shot should be a perfect plug, permitting no powder gas to get past or through it among the shot pellets. Theoretically also, the pellets should lie in the cartridge case in regular layers, and should be subjected to no influence likely to break up this regular system.

"These drawings illustrate what is supposed theoretically to take place in the gun under different circumstances. And though no one can state positively as yet what actually does take place at the moment of explosion, yet we do know sufficient to say these theories must be very near the truth. See Figs. 5, 6, 7, 8, 9 & 10.

"I need hardly say that an ideal pattern never occurs; many things militate against it. The result is irregular movement in the barrel, and deformation of the shot pellets, which is the most fruitful source of bad patterns, as the deformed pellets take a more divergent or irregular path than the perfect pellets. If a charge of shot is fired against a soft substance, such as a plate of low melting paraffin wax, and the pellets carefully extracted afterwards, it is found that the exterior contains many more deformed pellets than the interior portion of the pattern.

"This deformation is less with chilled shot than with soft shot, and less in cylinder than in choke guns, although the divergence of the cylinder is the greater. Another method of gauging the same

effect is by collecting and weighing the actual amount of lead dust produced when a charge is fired. By this I mean the tiny fragments and actual dust produced by the friction of the shot down the gun barrel. It can be estimated by firing the gun upwards at the bottom of a very long, large vertical tube; in practice I find it is necessary to use one about 60ft. long by 4ft. diameter. Hard shot loses more than does soft shot, in dust, but as it retains its shape better than the soft the resulting deformation is not quite so marked. With a choke this dust may amount to as much as 20 grains of lead, with a cylinder to as much as 15 grains, when using a charge $1\frac{1}{2}$ oz.

"So much for the theoretical aspect of the pattern. I propose now to deal with some actual examples. In attempting this, however, one is confronted by the enormous scope of the inquiry, making the giving of even a single instance of each resulting pattern produced by the combination of influences a simple impossibility to-day. Let me touch briefly on some of the more important points involved, and which may affect the resulting pattern.

"*The Gun*.—Its calibre. Weight. Length of barrel. Nature of cone. Method of boring. Internal condition.

"*The Cartridge Case*.—Its internal and external diameter. Length. Stiffness of tube. Material of Tube. Strength and composition of primer.

"*The Powder*.—Whether black or nitro-compound. Bulky or condensed. Weight of charge. Size of grain. Rate of combustion. Violent or slow. Strong or weak.

"*The Wadding*.—Soft or hard. Tight or loose. Many wads or few. Elasticity. Overshot wad tight or loose. Thin or thick. Tough or brittle.

"*The Shot*.—Its size. Its lie in the case. Quantity used. Whether soft. Hard chilled.

"*The Turnover*.—Square or round. Heavy or light.

"*The Range*.—Atmospheric conditions.

"It will be seen at once that a complete series of patterns showing the results with all these combinations is absolutely out of my power. We have, say, six principal points, each divided into six minor points, and each of these into at least six other points. To get any information at all reliable a series of shots must be fired on each point under each circumstance, and at all ranges and under all conditions mentioned. I have made a rough calculation, and think one might hope to get through and give a fair report on a series of about eighteen thousand millions. So I will from my former experiences pass over very rapidly the greater number, and bring down the actual examples to about twenty loads, fired from guns with three systems of boring, with three kinds of shot, making the series of about a thousand shots. But if

nyone is ambitious of carrying out a complete series of tests for patterns, I would suggest the following as a fairly complete scheme for the purpose.

" Let him try guns of five calibres, of three different weights, with three lengths of barrel, and two kinds of cone, with three methods of boring; and let him use three kinds of cartridge case, with three lengths of cap, loading with say, six kinds of powder, with three charges, and powders to show four different qualities as to strength and rate of combustion. The wadding to be of about eight different kinds between powder and shot, and of three kinds over shot; the shot to be of three kinds, and of five different sizes, adapted to lie in the case or not. Let the turnover be of four kinds, and shoot the whole at six different ranges.

" To take a single shot under each of these complications will involve a series of more than three thousand millions of rounds, and as at least six shots are required for a test, let us say in round numbers eighteen thousand million. And let him hurry up, or the rush of new powders will so involve him in new tests, he will end off in fifty years with more to do than when he started!

" Now as to my small manageable group.

" 1. *Calibre of Gun.*—The rule holds fairly well with all calibres, the smaller the calibre the less affected by the tightness or looseness of the wad, the condition of the turnover, or the nature of the overshot wad. Also slight variations in the actual internal diameter from the nominal bores do not affect the pattern provided the wads are equally tight-fitting, although velocity is increased with a nitro when the bore is smaller rather than larger than its actual nominal size. I shall therefore confine my remarks to results with a nominal twelve-bore gun.

" 2. *Weight of Gun.*—The heavy gun as a rule gives more regular pattern than does the very light gun. This is frequently traceable to the large amount of metal left at the actual muzzle, which by resisting the expansion acts somewhat after the manner of the choke, but independently of this the rule as to heavy and light guns I find fairly constant. I shall report therefore on guns between 6½lbs. and ½lbs.

" 3. *Length of Barrel.*—There is little effect on the pattern until the length is reduced below 26in. I prefer myself 28in. barrels for schultze powder. I shall show results therefore only with the barrels 28in. to 30in. long.

" 4. *Cone of Chamber.*—Deformation of the shot is more with a square than with a taper cone. I shall refer to a taper cone only.

" 5. *Boring of the Barrel.*—This has such an effect on the pattern, I shall show comparison of eight different kinds of boring but follow

out the series with three kinds only—choke, nominal cylinder, true cylinder.”

The nominal cylinder here referred to is usually called a modified choke bore. The true cylinder is a mathematically true cylinder, and therefore bears little relation to the old method of boring.

“I show here a view indicating the probable action of choking in keeping the area of the spread smaller. The shot pellets are thrown over on themselves.

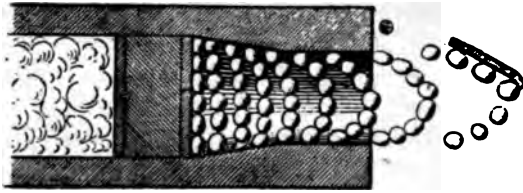
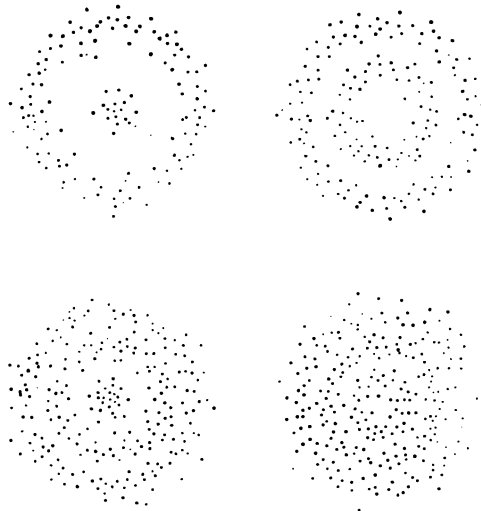


FIG. 6.

“An extremely vital essential is that the boring must be free from any rifling or spiral groove, which would tend to throw the charge shot into a revolving condition; the result of such in the pattern is the production of what we may call cart-wheel patterns, examples of which are shown in the four patterns here reproduced.



“CART-WHEEL” PATTERNS.

“6. *The Cartridge Case.*—The more true this is to its gauge both in internal and external measurements, the better the effect on the regularity of the pattern. I show results only with well-fitting cases.

"7. *The Length of the Cartridge Case.*—This is hardly material if it is of such a length as to correspond with the chamber of the gun. Otherwise it has a very important influence.

"To illustrate this I have a view showing the action when the chamber is (a) of correct length for the case."



FIG. 7.

We would point out that the perfect lines of the shot here shown (both vertically and laterally) could neither be maintained throughout the bulk ; it is mechanically impossible in a round cartridge case.

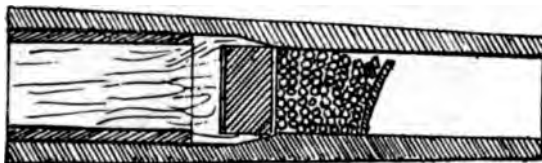


FIG. 8.

"Also one (b) showing the chamber too long for the case. In this instance the gases get past the wad, and will assuredly spoil the pattern, probably producing clustering also.

"Also (c) showing where the case is too long for the chamber. In this instance the shot is jammed and balling will be the result.

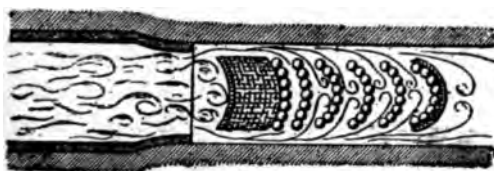


FIG. 9.

"8. *The Nature of the Tube.*—This has a considerable effect when nitros are used, though not so much with black powder. It is, however, readily adjusted by means of proper wads and turnover. I shall refer to one kind only, the stiff paper tube.

"9. *The Primer.*—The strength and composition of this has but little influence on the patterns within ordinary limits, beyond these it does have some effect. I shall, therefore, refer to three strengths—normal, strong, and extra strong caps.

"10. *The Powder.*—Nitros with equal velocity can give a better pattern than black. I shall not refer to this, therefore, and for the nitros, there are now so many different kinds, I hope I may be excused if I confine myself to that I understand the best, my own powder, Schultze.

"11. *The Charge of Powder.*—Within certain limits has not much effect on the pattern, beyond this it has some effect. I shall show examples of three different charges.

"12. *Rate of Combustion of the Powder.*—This has considerable effect on the pattern. I shall show results with three different rates of combustion.

"13. *The Wadding. Whether tight or loose.*—Now a tight wad is an absolute essential to good patterns. I show a view illustrating a loose wad and the powder gas passing, a fruitful source of balling. I shall show the different results with each kind.

"14. *Wads. Soft or Hard. Thick or Thin.*—These all affect the pattern. I shall show results with each variation.

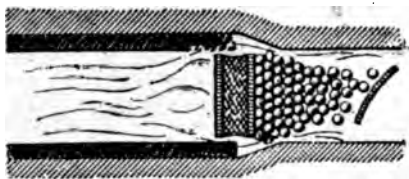


FIG. 10.

"15. *Wads. Many or Few.*—This is also a material point, but as a fair amount between powder and shot is necessary, I shall show with this only—that is, from $\frac{1}{2}$ to $\frac{3}{4}$ in. in all.

"16. *Wads. How Placed.*—This is, squarely or slanting. It is essential the wads rest squarely in the case. I shall show results with both positions of the wad.

"17. *The Shot.*—The size affects the pattern; the smaller the shot the more irregular the pattern, other things being equal. I shall confine my results to one size only—that is, No. 6, running 270 to the ounce.

"18. *Charge of Shot.*—This does affect the pattern naturally, but as any increase in the shot charge is generally accompanied with a corresponding increase in the powder charge, and this controls the resulting pattern, I shall show results with one charge only—that is, $1\frac{1}{8}$ oz.

"19. *Nature of the Shot. Whether soft, hard, or chilled.*—The softer the shot the more there is a risk of deformation and irregular pellets. I have used all three kinds very extensively, and will now show a comparative table of results with each kind on a long series of shots.

"There is a little variation in the specific gravity of the shot I used, but all the patterns were taken with the same number of pellets, 304. I find the soft shot gives only 299 pellets, and the hard shot only 297 pellets to the $1\frac{1}{8}$ ounce; while the chilled weighs exactly this amount with the 304 pellets. The patterns shown will be with chilled shot.

"Comparison of Patterns taken with 42 gns. Schultze and $1\frac{1}{8}$ oz. (304 pellets) No. 6 Soft, Hardened, and Chilled Shot. Range 40 yards. Average of 100 shots each kind.

Gun Target.	Choked .740" to .706"			Nl. Cylinder .740" to .717"			True Cylin- der .734"		
	30"	6ft	Ttl.	30"	6ft.	Ttl.	30"	6ft.	Ttl.
Soft Shot	206	83	289	155	117	272	118	149	267
Difference on lowest.....	25%	-	5%	28%	—	21%	36%	—	22%
Hardened Shot	208	82	290	158	118	276	121	146	267
Difference on lowest.....	22%	—	5%	29%	—	20%	34%	—	22%
Chilled Shot	211	82	293	157	122	279	121	149	270
Difference on lowest.....	20%	—	4%	27%	—	20%	33%	—	22%

"20. *The Turnover.*—This has a great influence upon the pattern, and varies as light, normal or heavy turnover is given to the case. The usual rule being the heavier the turnover the lighter the pattern, but this does not always hold good. I shall show examples of patterns with each—that is, with a turnover of about one-eighth, one-fourth and three-eighths of an inch respectively.

"Comparison of Results obtained with various degrees of Choking of the Barrel, averages of many rounds with 42 grains Schultze, and $1\frac{1}{8}$ oz. No. 6 shot, Soft, Hardened, and Chilled.

Length of Barrel.	Amount of Choke.	Mean Velocity.		Pattern, 40 yards.		
		Muzzle.	40 yds.	30"	6ft. ring.	Total 6ft. diam.
		ft. sec.	ft. sec.			
30"	.740" to .704"	1235	876	222	80	302
30"	.735" to .705"	1233	875	218	82	300
28"	.733" to .705"	1233	872	217	81	298
28"	.740" to .706"	1229	870	212	83	295
30"	.740" to .707"	1224	868	209	80	289
28"	.735" to .713"	1219	860	183	103	286
28"	.740" to .717"	1195	844	155	131	276
30"	.734" to .734"	1158	818	120	152	272
	none.					

"The enormous mass of varieties is now reduced for our present purposes to experiments made with twelve-bore, central-fire, double-barrel guns, from 6½lbs. to 7½lbs. in weight, 28 to 30 inches long in the barrel, with taper cone. The cases well fitting, true to dimensions, stiff paper tubes, loaded with Schultze powder, with a fair amount of wadding between powder and shot, and 1½ oz. No. 6 chilled shot. The gun fired from the shoulder. With this as a foundation I have tried eight different kinds of boring for comparison in pattern and velocity, and from these I have selected three guns for the pattern experiments. The table on p. 233 shows the results with the eight systems of boring, and it will be seen the pattern and the velocity run higher in regular sequence with the amount of choking in the gun.

"Enquiries on patterns may run on two distinct lines: either in an attempt to improve the pattern of a poor shooting gun, or to show the variations possible even with a really good shooting gun. I did think at one time of taking up the first method for to-day, and it is very interesting to watch the improvement step by step, but time at my disposal is too short, and also nowadays the boring of the gun is carried to such a pitch of excellence, it is somewhat difficult to find a selection of bad guns. So I shall confine myself to the other path, that of showing how with a very good shooting gun the patterns may be increased or spoiled by various conditions of the load. Among these conditions the wadding has the most important place on the whole: my first eight patterns will, therefore, form a group on differences of the wadding. Then I will follow with groups as to turn-over, length of chamber, strength of caps, charge of powder, and strength of powder.

"For each of the patterns shown about ten shots were fired with three different kinds of barrel, that is—

"A choke measuring .740 to .707 of an inch.

"A nominal cylinder measuring .740 to .717 of an inch.

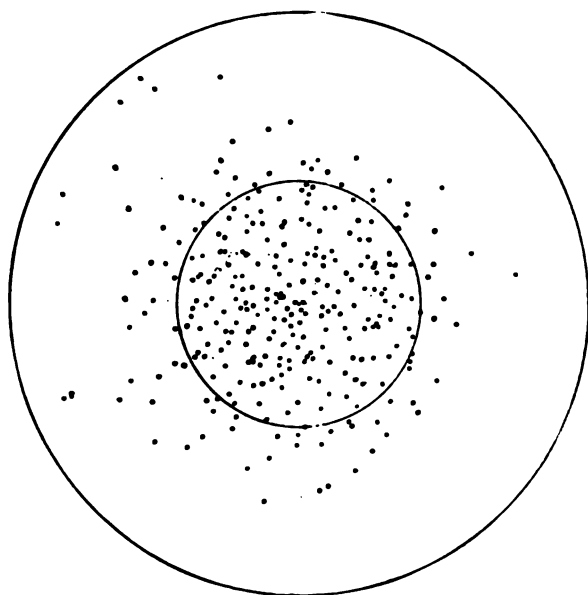
"A true cylinder measuring .734 of an inch.

"The pattern I have selected for each plate is the one which on examination of the series appeared to show the pattern characteristic the best. You may take each to be, therefore, a sample of the average pattern produced under such circumstances in any series that may be fired. I found the distinctive features of the pattern run fairly true, whether it be choke or cylinder, and as from the open nature of the cylinder pattern the differences are not so accentuated, I shall show, with a few exceptions, patterns from a choke only, and moreover I find such choke patterns reduced to the proportionate number, fairly represent the cylinder pattern with the same load. But for information I will put alongside the choke results those also obtained with the more open bores. Also I will show the lowest shot in the series,

and the percentage difference between this and the average, as this gives us valuable information on the score of regularity. The plates will show the pellets in the 30-inch circle, and also those in a ring outside of this up to six feet in diameter. The range in every case forty yards.

“FIRST GROUP.—WADDING.

“No. 1. Shows the ordinary field system of loading, a very excellent one, depending for its usefulness on the tight powder wad. A choke pattern is reproduced.



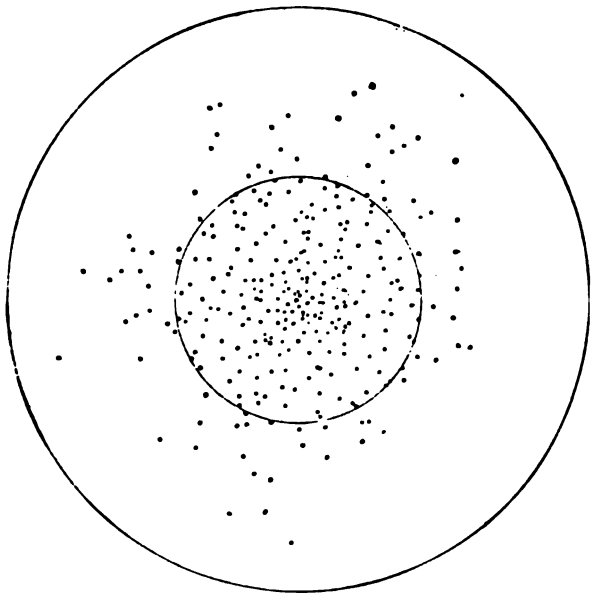
CHOKE PATTERN. 30 inch, 201. 6 ft., 94. Total, 295.

Length of Case, $2\frac{1}{2}$ in.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder "Field" Card, 11 $\frac{1}{2}$.
Wads, Felt, $\frac{3}{8}$ in.
Wads, Card, thin. Thick Card over shot.
Shot, size and weight, 304 Pellets, 1 $\frac{1}{2}$ oz.,
No. 6, Chilled.

Turnover, Fair.
Internal Pressure, 1 in., 2.69 tons.
Internal Pressure, 2 $\frac{3}{4}$ ins., 2.71 tons.
Gun Recoil, 25.2.
Time in Barrel, .0056 sec.
Muzzle Velocity, 1,208 ft.

	Choke.	Nom. Cylinder.	True. Cylinder.
Pattern, 30 in.	201	151	114
Do. 6 ft.	94	134	150
Total	295	285	264
Lowest Difference $\%$, 30 ins.	14	24	16
Do. do. 6 ft.	4	11	11
Total	283	253	236

“ No. 2. The difference between this system and the preceding one is in the substitution of a ‘ Field ’ card for the older and thicker form. I have come to the definite conclusion that, with the stronger caps of the present day, this form of wad is even better for the powder than the thicker ‘ Field ’ wad, giving as it does a little more regularity and velocity than the former. A choke pattern is reproduced.



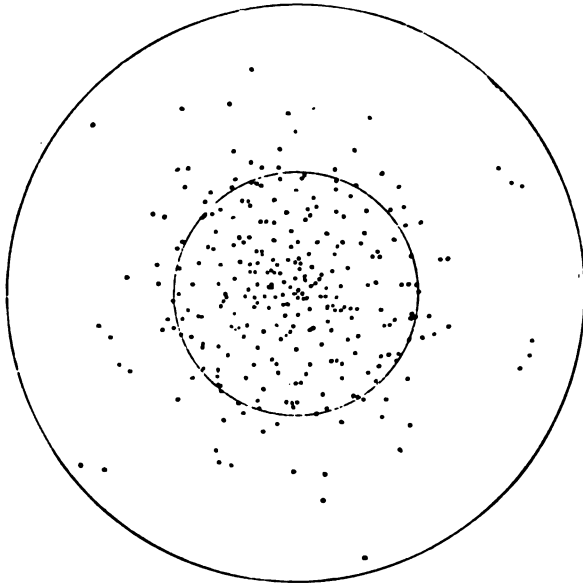
CHOKE PATTERN. 30 in., 215. 6 ft., 85. Total, 300.

Length of Case, 2½ ins.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder, “ Field ” Card, 11½.
Wads, Felt, ¾ ins.
Wads, Card, Thin. Thick Card over Shot.
Shot, size and weight, 1¼ oz. No. 6,
Chilled.

Turnover, Fair.
Internal Pressure, 1 in., 2·71 tons.
Internal Pressure, 2½ in., 2·77 tons.
Gun Recoil, 26·0.
Time in Barrel, ·0056 secs.
Muzzle Velocity, 1,230 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.....	215	159	122
Do. 6 ft.....	85	126	150
Total	300	285	272
Lowest Difference %, 30 in.....	18 ..	20	20
Do. do. 6 ft.....	4	11	8
Total	288	255	249

"No. 3. The difference between this system and the preceding one is the use of a thin card wad over the shot instead of a thick one. It frequently gives a little better pattern than the thicker wad, with a little loss on velocity. But it has a tendency at the same time to distribute the pellets in lines. A choke pattern is reproduced.



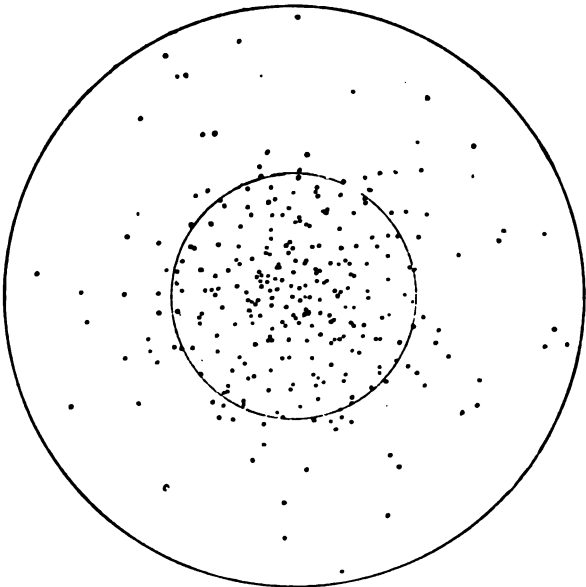
CHOKE PATTERN. 30 in., 210. 6 ft., 84. Total, 294.

Length of Case, 2½ ins.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder, "Field" Card, 11½.
Wads, Felt, ¾ ins.
Wads, Card. Thin Card over Shot.
Shot, size and weight, 1¼ ozs. No. 6,
Chilled.

Turnover, Fair.
Internal Pressure, 1 in., 2.65 tons.
Internal Pressure, 2½ in., 2.67 tons.
Gun Recoil, 26.0.
Time in Barrel, .0063 sec.
Muzzle Velocity, 1,222 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 ins.	218	165	121
Do. 6 ft.	78	106	152
Total	296	271	273
Lowest Difference %, 30 in.	14	35	45
Do. do. 6 ft.	5	15	17
Total	282	229	225

“ No. 4. In this loading a very soft felt wad is used instead of the ordinary firm one, in conjunction with a thin card for the over-shot wad. It is useful in a gun that is worn or large for the bore, and also when a gun has a tendency to form clusters with a harder wad. Otherwise it has very little effect.

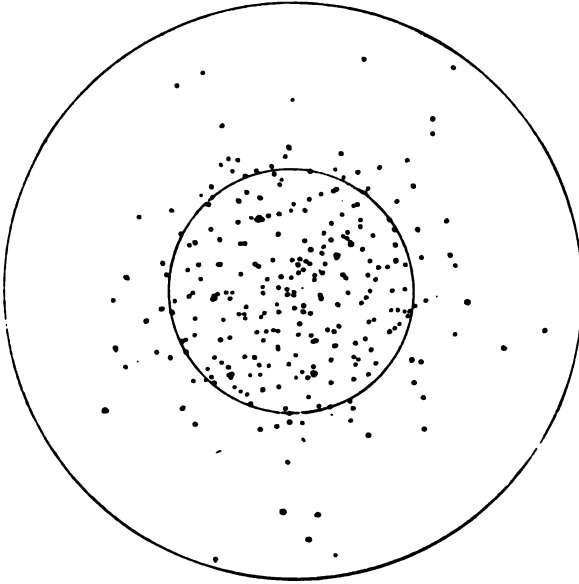


CHOKE PATTERN. 30 in., 210. 6 ft., 84. Total, 294.

Length of Case, 2½ in.	Turnover, Fair.
Primer Strength, 100 units.	Internal Pressure, 1 in., 2.49 tons.
Powder Charge, 42 grns.	Internal Pressure, 2½ in., 2.57 tons.
Wads on Powder, “ Field ” Card, 11½.	Gun Recoil, 24.8.
Wads, Felt. Very soft, ¾ in.	Time in Barrel, .0066 sec.
Wads, Card, Thin. Thin Card over shot.	Muzzle Velocity, 1,215 ft.
Shot, size and weight, 1¼ oz., No. 6.	
Chilled.	

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.....	210	146	120
Do. 6 ft.....	84	128	147
Total	294	274	267
Lowest Difference %, 30 in.	18	44	55
Do. do. 6 ft.	5	9	16
Total	280	249	225

"No. 5. This, on the contrary, is with very hard wads. Hard wads always increase the velocity, and also very much the pressure; in fact, it is possible to get equal penetration with a less charge of powder when very hard wads are used. But the pattern is nearly always spoiled by such wads running patchy and sometimes balling.



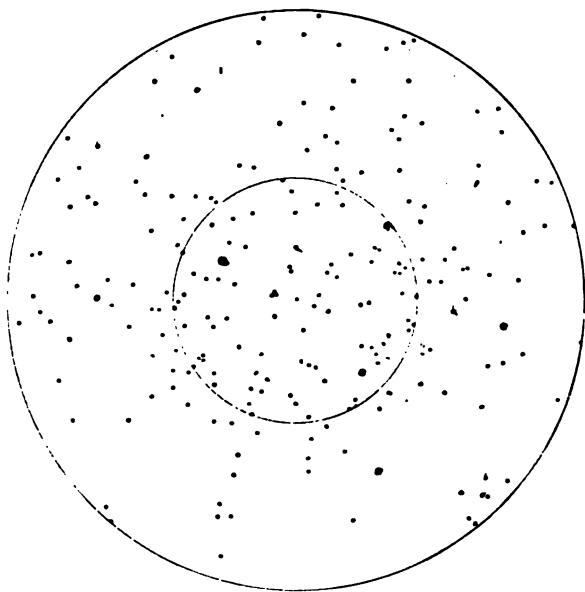
CHOKE PATTERN. 30 in., 207. 6 ft., 79. Total, 286.

Length of Case, 2½ in.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder, 4 Hard Black Edge.
Tight fitting.
Wads, Felt, none.
Wads, Card, none. Thick Card over
Shot.

Shot, size and weight, 1½ oz., No. 6,
Chilled.
Turnover, Fair.
Internal Pressure, 1 in., 3.77 tons.
Internal Pressure, 2½ in., 3.65 tons.
Gun Recoil, 30.6.
Time in Barrel, .0048 sec.
Muzzle Velocity, 1,294 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	207	163	108
Do. 6 ft.	79	106	149
Total!	286	269	257
Lowest Difference %, 30 in.	38	44	36
Do. do. 6 ft.	6	9	6
Total	268	244	242

"No. 6. This is loaded with loose wadding all through, wads that drop into the case. It is entirely *fatal* to good shooting; the powder gases get past the wads into the shot, and the pattern is not only spoiled, but the penetration injured very considerably. It is a fruitful source of balling.



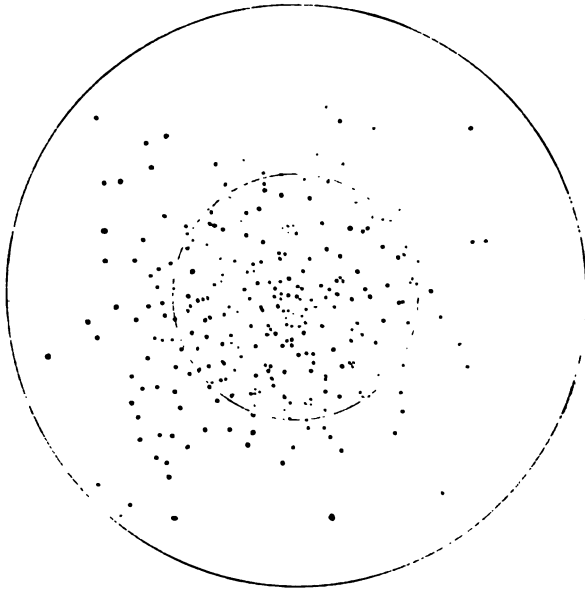
CHOKE PATTERN. 30 in., 108. 5 ft., 142. Total, 250.

Length of Case, $2\frac{1}{2}$ in.
 Primer Strength, 100 units.
 Powder Charge, 42 grs.
 Wads, on Powder, Card.
 Wads, Felt, $\frac{3}{4}$ in.
 Wads, Card, Thin. Thick Card over
 Shot.
 Shot, size and weight, $1\frac{1}{2}$ oz., No. 6,
 Chilled.

Turnover, Fair.
 Internal Pressure, 1 in., 2.18 tons.
 Internal Pressure, $2\frac{3}{4}$ in., 2.46 tons.
 Gun Recoil, 20.1.
 Time in Barrel, .0060 sec.
 Muzzle Velocity, 926 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	108	106	96
Do. 6 ft.	142	132	132
Total.....	250	238	228
Lowest Difference %, 30 in.....	18	25	28
Do. do. 6 ft.....	6	11	10
Total.....	236	212	206

"No. 7. In this case the powder wad was pushed down slanting and left so. When this happens it always means a loss of velocity, and the pattern is damaged more or less, very often being thrown over on the side to which the slanting was pointed.

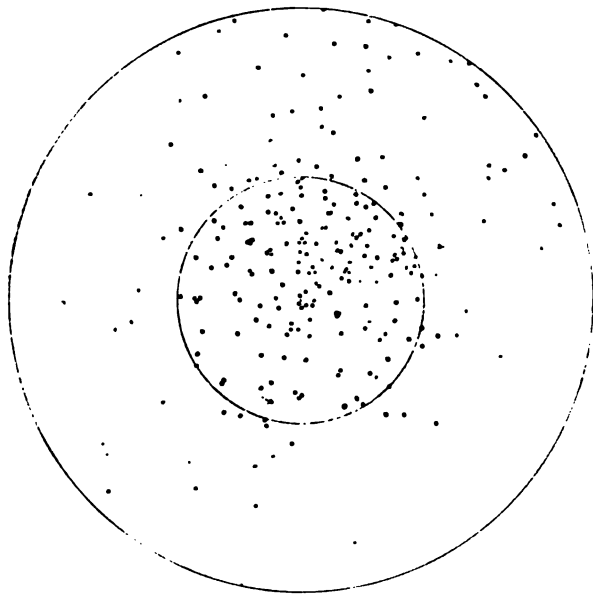


CHOKE PATTERN. 30 in., 197. 6 ft., 92. Total, 289.

Length of Case, 2½ in.	Turnover, Fair.
Primer Strength, 100 units.	Internal Pressure, 1 in., 2.70 tons.
Powder Charge, 42 grns.	Internal Pressure, 2½ in., 2.80 tons.
Wads, on Powder, "Field" Card, 11½.	Gun Recoil, 26.2.
Wads, Felt, ½ in.	Time in Barrel, .0056 sec.
Wads, Card, Thin. Thick Card over Shot.	Muzzle Velocity, 1,188 ft.
Shot, size and weight, 1½ oz., No. 6, Chilled.	

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	197	150	119
Do. 6 ft.	92	118	146
Total.....	289	268	265
Lowest Difference % 30 in.....	17	24	25
Do. do. 6 ft.	2	7	3
Total.....	282	249	246

"No. 8. Here all the wads were pushed in slanting, and the turnover was also oblique; it is an exaggerated example, but one sees something approaching it sometimes. The result is a still further loss of velocity, and a pattern thrown distinctly over towards the way of the slant: in this case it was pointing upwards.



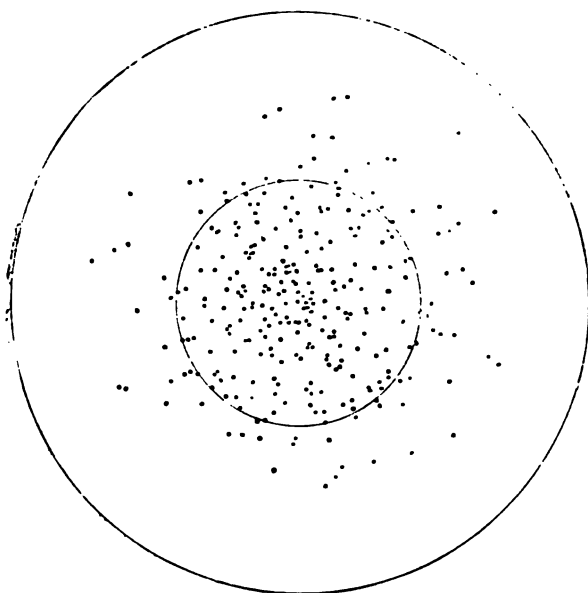
CHOKE PATTERN. 30 in., 160. 6 ft., 95. Total, 255.

Length of Case, 2½ in.	Turnover, Fair.
Primer Strength, 100 units.	Internal Pressure, 1 in., 2.76 tons.
Powder Charge, 42 grns.	Internal Pressure, 2½ in., 2.72 tons.
Wads, on Powder, "Field" Card, 11½.	Gun Recoil, 25.5.
Wads, Felt, 2 in.	Time in Barrel, .0060 sec.
Wads, Card, Thin. Thick Card over Shot.	Muzzle Velocity, 1,115 ft.
Shot, size and weight, 1½ oz., No. 6, Chilled.	

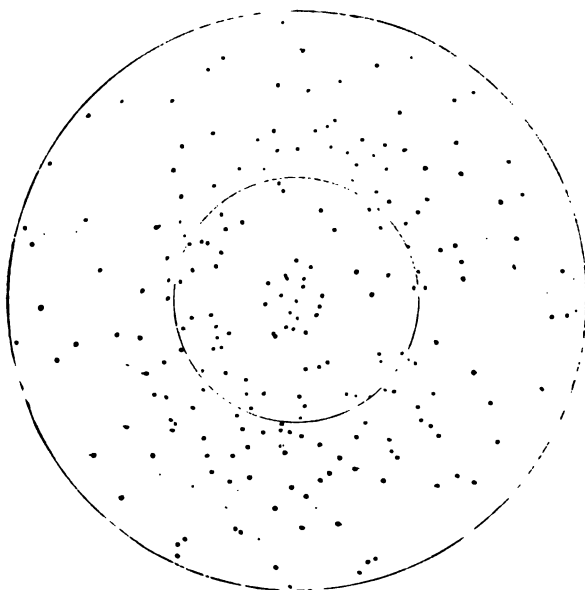
	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	160	121	90
Do. 6 ft.	95	127	144
Total	255	248	234
Lowest Difference % 30 in.	54	25	45
Do. do. 6 ft.	8	8	12
Total.....	234	227	206

"SECOND GROUP.—TURNOVER.

"No. 9. This case was turned over only about ¼ in. It always means loss of velocity, and generally an increase in the pattern, but a tendency to a patchy pattern. With a cylinder sometimes one gets a cart-wheel pattern with this light turnover. Patterns with a choke and a cylinder gun are reproduced.



CHOKE PATTERN. 30 in., 210. 6 ft., 79. Total, 289.



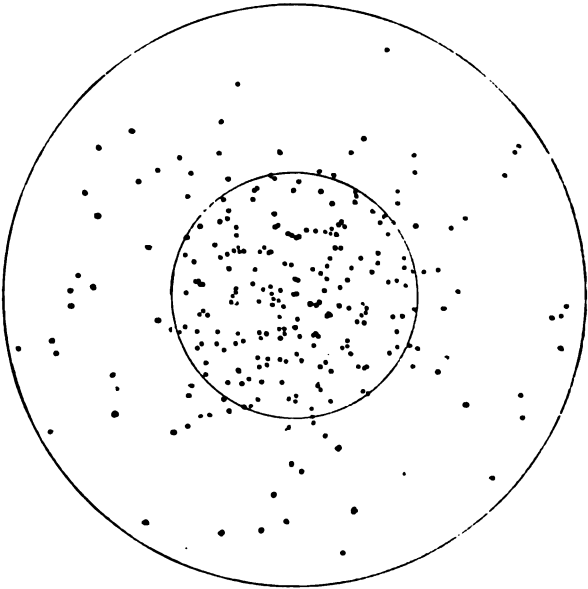
TRUE CYLINDER PATTERN. 30 in., 45' 6 ft., 200. Total, 245.

Length of Case, 2½ in.
 Primer Strength, 100 units.
 Powder Charge, 42 grs.
 Wads, on Powder, "Field" Card, 11½.
 Wads, Felt, ½ in.
 Wad, Card, Thin Card. Thick Card over
 Shot.
 Shot, size and weight, 1½ oz., No. 6,
 Chilled.

Turnover, Very Light.
 Internal Pressure, 1 in., 2.13 tons.
 Internal Pressure, 2½ in., 2.18 tons.
 Gun Recoil, 25.0.
 Time in Barrel, .0067 sec.
 Muzzle Velocity, 1,198 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	210	156	123
Do. 6 ft.	79	115	137
Total.....	289	271	260
Lowest Difference %, 30 in.....	25	38	51
Do. do. 6 ft.	4	3	6
Total... ..	276	262	245

“No. 10. Here a very heavy turnover was used, about $\frac{3}{8}$ in. This always increases the pressures, but with no corresponding increase in velocity, and it nearly always spoils the pattern, making it patchy and inclined to cluster.



CHOKE PATTERN. 30 in., 192. 6 ft., 80. Total, 272.

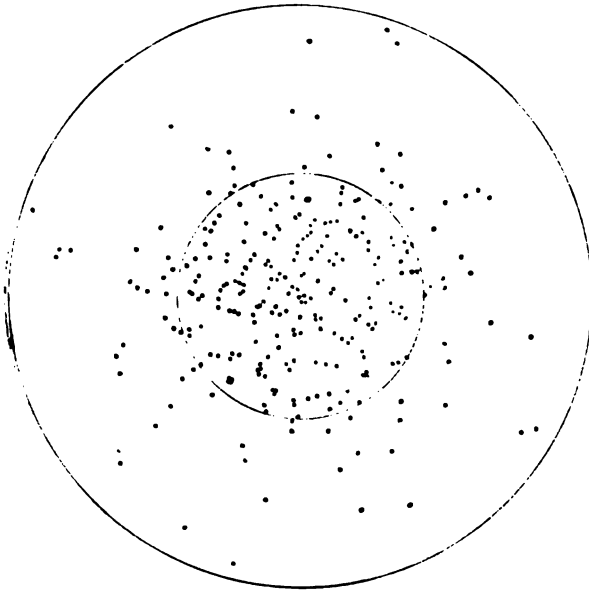
Length of Case, 2½ in.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder, "Field" Card, 11½.
Wads, Felt, ¼ in.
Wads, Card, Thin. Thick Card over Shot.
Shot, size and weight, 1½ oz., No. 6,
Chilled.

Turnover, Very Heavy.
Internal Pressure, 1 in., 3·03 tons.
Internal Pressure, 2½ in., 3·00 tons.
Gun Recoil, 26·6.
Time in Barrel, 0·054 sec.
Muzzle Velocity, 1,205 ft.

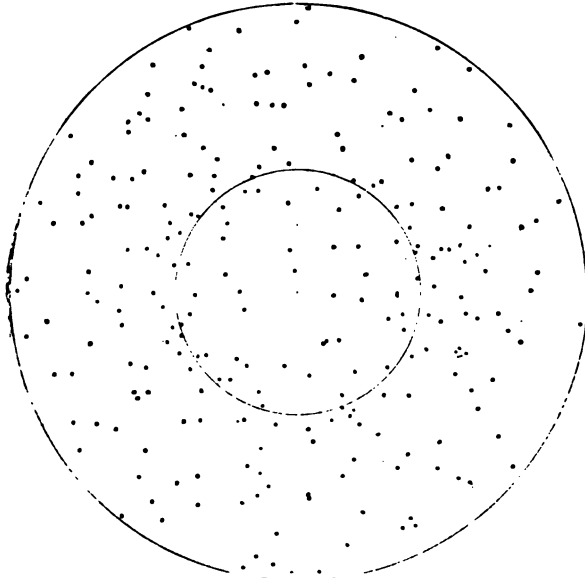
	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	192	141	118
Do. 6 ft.	80	125	135
Total.....	272	266	253
Lowest Difference %, 30 in.....	29	42	24
Do. do. 6 ft.	7	14	11
Total	254	229	226

"THIRD GROUP.—LENGTH OF CHAMBER.

"No. 11. In this case a $2\frac{3}{4}$ in. case was used in a $2\frac{1}{2}$ in. chamber. This will increase the pressures and generally the velocity, but gives patchy patterns, clustering, and frequently balling. Sometimes a fine specimen of a cart-wheel pattern results when such conditions arise in a cylinder gun. A cylinder pattern is also shown.



CHOKE PATTERN. 30 in., 194. 6 ft., 82. Total, 276



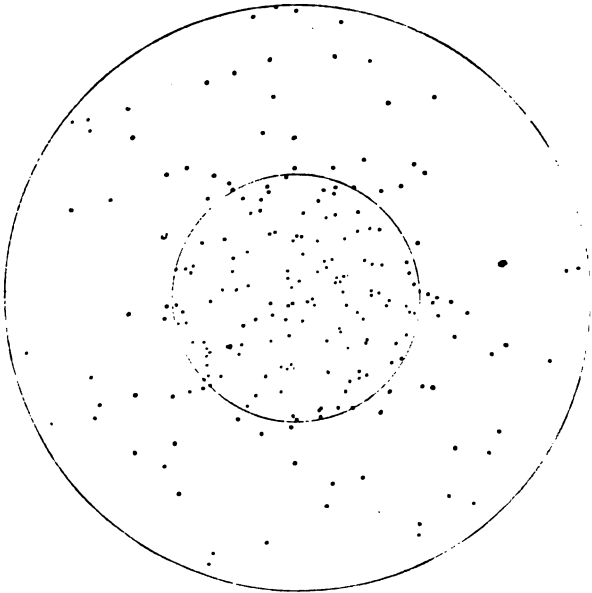
TRUE CYLINDER PATTERN. 30 in., 67. 6 ft., 154. Total 221.

Length of Case, 2½ in.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder, "Field" Card, 11½.
Wads, Felt, ½ in.
Wads, Card, Thin. Thick Card over Shot.
Shot, size and weight, 1¼ oz., No. 6,
Chilled.

Turnover, Fair.
Internal Pressure, 1 in., 3·22 tons.
Internal Pressure, 2½ in., 3·27 tons.
Gun Recoil, 28·7.
Time in Barrel, ·0052 secs.
Muzzle Velocity, 1,237 ft.

	Choke.	Noni. Cylinder.	True Cylinder.
Pattern, 30 in.	194	153	116
Do. 6 ft.	82	120	146
Total	276	276	262
Lowest Difference % 30 in.	15	14	36
Do. do. 6 ft.	0	9	14
Total	276	248	226

"No. 12. Here the conditions are still worse, for the case was 3 in. long, in a 2½ in. chamber. Such a condition will not often arise, but it does sometimes. The result is an enormous strain on the gun, a large velocity, and always more or less balling.



CHOKE PATTERN. 30 in., 178. 6 ft., 95. Total, 273.

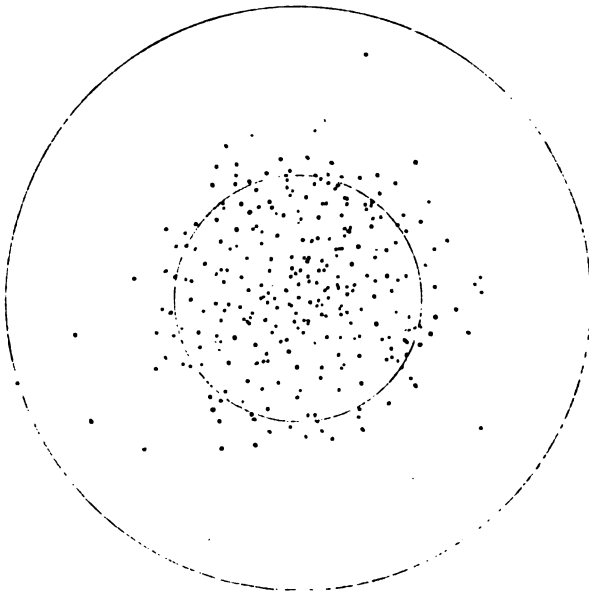
Length of Case, 3 in.
Primer Strength, 100 units.
Powder Charge, 42 grns.
Wads, on Powder, "Field" Card, 11½.
Wads, Felt, 2 in. by ¾ in.
Wads, Card, Thin. Thick Card over
Shot
Shot, size and weight, 1¼ oz., No. 6,
Chilled.

Turnover, Fair.
Internal Pressure, 1 in., 3·71 tons.
Internal Pressure, 2½ in., 3·52 tons.
Gun Recoil, 30·2.
Time in Barrel, ·0048 sec.
Muzzle Velocity, 1,261 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	178	134	103
Do. 6 ft.	95	120	145
Total.....	273	254	248
Lowest Difference % 30 in.	45	24	23
Do. do. 6 ft.	7	5	4
Total.....	254	241	237

“FOURTH GROUP.—STRENGTH OF CAP.

“No. 13. This cap is of the strength as called by Messrs. Eley their medium cap, and is about the same as issued by other makers. An increase in strength of this nature has no effect on the pattern at all. It, however, quickens the time of ignition a little, and as a cap of this strength is less likely to show the effect of insufficiency of fulminate from irregular loading, I am now recommending such caps for our powder. The velocity is generally improved a few feet.



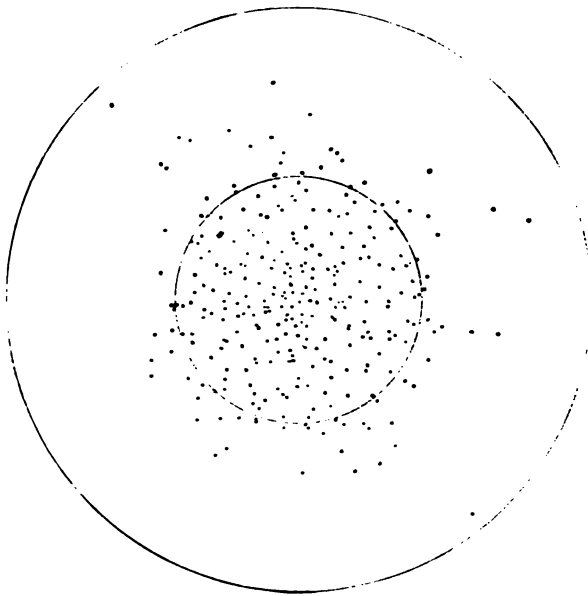
CHOKE PATTERN. 30 in., 215. 6 ft., 83. Total, 298.

Length of Case, 2½ ins.
Primer Strength, 150 units.
Powder Charge, 42 grns.
Wads, on Powder, “Field” Card, 11½.
Wads, Felt, 3 in. Felt.
Wads, Card, Thin. Thick Card over Shot.

Shot, size and weight, 1½ oz. No. 6, Chilled.
Turn over, Fair.
Internal Pressure, 1 in., 275.
Internal Pressure, 2½ in., 281.
Gun Recoil, 25.9.
Time in Barrel, .0046 sec.
Muzzle Velocity, 1,237 ft.

	Choke.	Nom. Cylinder.	True Cylinder
Pattern, 30 in.	215	161	120
Do. 6 ft.	83	128	149
Total	298	289	269
Lowest Difference % 30 in.	15	23	20
Do. do. 6 ft.	3	15	6
Total	288	246	272

"No. 14. This is a cap of still greater strength. It has a little effect in reducing the pattern, but very little. It does, however, increase the pressures, and shows no corresponding advantage in velocity.



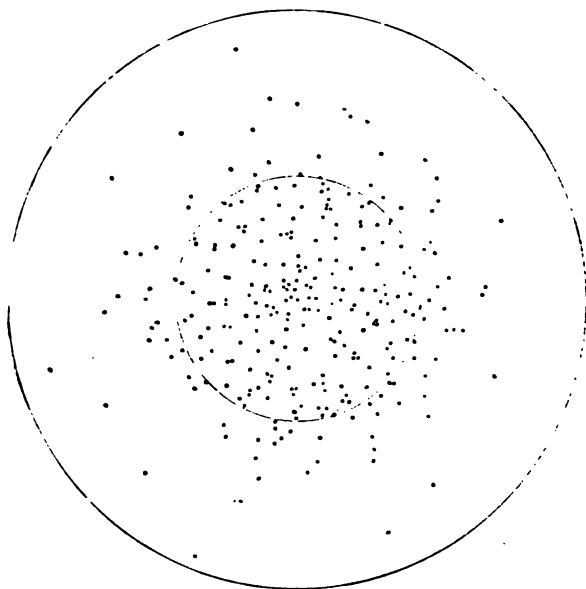
CHOKE PATTERN. 30 in., 212. 6 ft., 80. Total, 292.

Length of Case, 2½ in.	Shot, size and weight, 1½ oz., No. 6, Chilled.
Primer Strength, 180 units.	Turnover, Fair.
Powder Charge, 42 grns.	Internal Pressure, 1 in., 2.82 tons.
Wads, on Powder, "Field" Card, 11½.	Internal Pressure, 2½ in., 2.89 tons.
Wads, Felt, 2 in.	Gun Recoil, 26.3.
Wads, Card, Thin. Thick Card over	Time in Barrel, .0042 sec.
Shot.	Muzzle Velocity, 1,236 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	212	154	118
Do. 6 ft.	80	122	140
Total	292	276	258
Lowest Difference % 30 in.	20	27	20
Do. do. 6 ft.	7	12	4
Total	272	241	248

"FIFTH GROUP.—CHARGE OF POWDER.

"No. 15. An increase of $\frac{1}{4}$ drachm of powder gives, of course, a corresponding increase in velocity and pressure, and lowers the pattern, but without spoiling it.



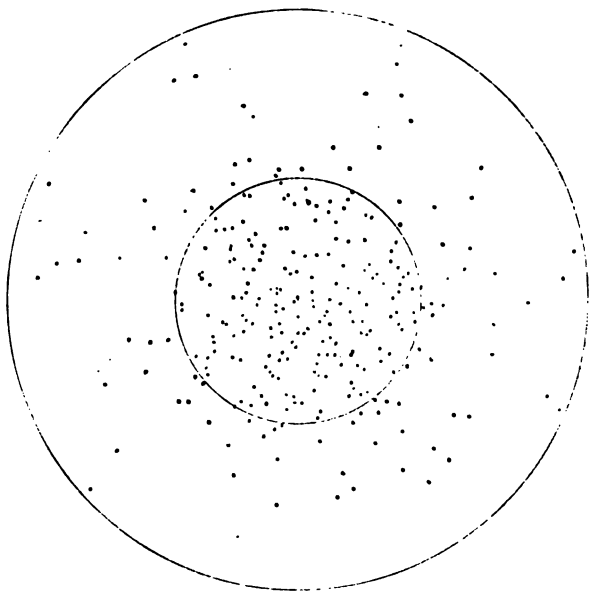
CHOKE PATTERN. 30 in., 192. 6 ft., 92. Total. 284.

Length of Case, $2\frac{1}{2}$ in.
 Primer Strength, 100 units.
 Powder Charge, $45\frac{1}{2}$ grns.
 Wads on Powder, "Field" Card, 11 $\frac{1}{2}$.
 Wads, Felt, $\frac{3}{8}$ in.
 Wads, Card. Thin. Thick Card over
 Shot.

Shot, size and weight, $1\frac{1}{4}$ oz., No. 6, Chilled.
 Turnover, Fair.
 Internal Pressure, 1 in., 3.23 tons.
 Internal Pressure, 2 in., 3.29 tons.
 Gun Recoil, 29.6.
 Time in Barrel, .0055 sec.
 Muzzle Velocity, 1,274 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	192	147	116
Do. 6 ft.	92	123	148
Total	284	270	264
Lowest Difference, 30 in.	17	25	21
Do. do. 6 ft.	2	13	6
Total	278	235	246

“No. 16. An increase to 3½ drachms of powder still further increases the velocity and pressures, and it also begins to operate against the pattern, making it poorer and more irregular.



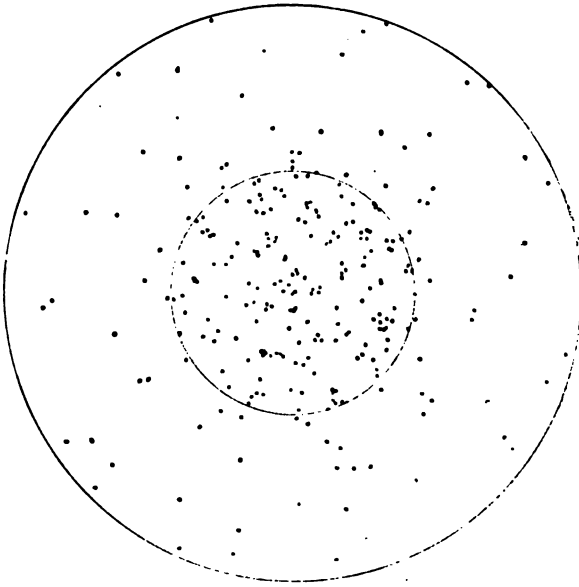
CHOKE PATTERN. 33 in., 182. 6 ft., 91. Total, 273.

Length of Case, 2½ in.	Shot, size and weight, 1½ oz., No. 6, Chilled.
Primer Strength, 100 units.	Turnover, Fair.
Powder Charge, 49 grns.	Internal Pressure, 1 in., 3·87 tons.
Wads, on Powder, “Field” Card, 11½.	Internal Pressure, 2½ in., 3·84 tons.
Wads, Felt, 7½.	Gun Recoil, 33·9.
Wads, Card, Thin. Thick Card over	Time in Barrel, ·0069 sec.
Shot	Muzzle Velocity, 1,328 ft.

	Choke.	Nom. Cylinder.	True Cylinder.
Pattern, 30 in.	182	136	111
Do. 6 ft.	91	117	140
Total.....	273	253	251
Lowest Difference , 30 in.	39	33	33
Do. do. 6 ft.	9	8	4
Total.....	249	233	242

"SIXTH GROUP.—STRENGTH OF POWDER.

"No. 17. The powder here was made specially strong and quick in combustion. Such gives of course more pressure and a greater velocity to the shot, but it at the same time spoils the pattern, making it patchy and clustering.

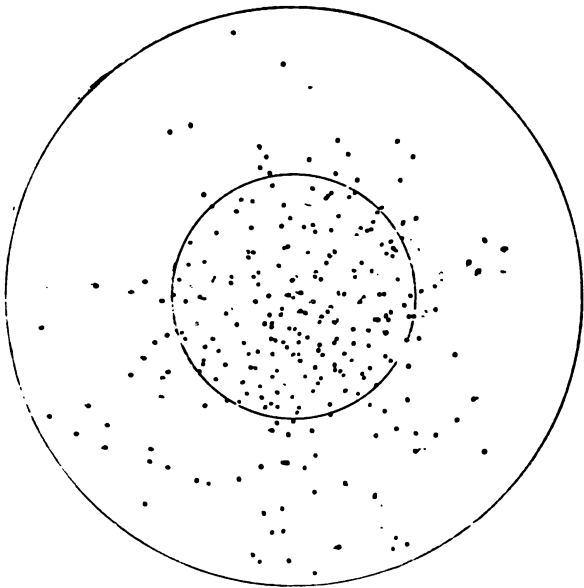


CHOKE PATTERN. 30 in., 181. 6 ft., 85. Total. 266.

Length of Case, 2½ in.	Shot, size and weight, 1½ oz., No. 6, Chilled.
Primer Strength, 100 units.	Turnover, Fair.
Powder Charge, 42 grs.	Internal Pressure, 1 in., 3.28 tons.
Wads, on Powder, "Field" Card, 11½	Internal Pressure, 2½ ins., 3.19 tons.
Wads, Felt, ¾ in.	Gun Recoil, 28 lb.
Wads, Card, Thin. Thick Card over	Time in Barrel, .0048 sec.
Shot.	Muzzle Velocity, 1,249 ft.

	Choke.	Nom. Cylinder.	True Cylinder..
Pattern. 30 in.	181	140	111
Do. 6 ft.	85	107	135
Total	266	247	246
Lowest Difference , 30 in.	78	49	59½
Do. do. 6 ft.	14	11	14
Total	228	221	212

“No. 18. This powder was made specially weak. The result is a very poor velocity, and low pressures, but this is not counter-balanced by a very fine pattern: with such the pattern is usually drooping and patchy. With such powder and loose wads, balling can be produced readily.



CHOKE PATTERN. 30 in., 185. 6 ft., 96. Total, 281.

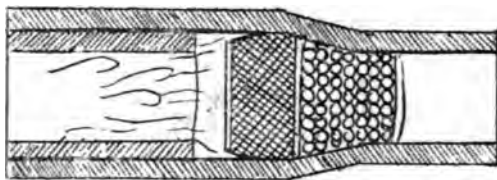
Length of Case, 2½ in.	Shot, size and weight, 1¼ oz., No. 6, Chilled.
Primer Strength, 100 units.	Turnover, Fair.
Powder Charge, 42 grns.	Internal Pressure, 1 in., 1.83 tons.
Wads, on Powder, “Field” Card, 11½.	Internal Pressure, 2½ in., 1.83 tons.
Wads, Felt, 3 in.	Gun Recoil, 22.6.
Wads, Card, Thin. Thick Card over Shot.	Time in Barrel, .0079 sec.
	Muzzle Velocity, 1,081.

	Choke.	Nom. Cylinder.	True Cylinder-
Pattern, 30 in.	185	160	128
Do. 6 ft.	96	121	150
Total	281	281	278
Lowest Difference 30 in.	22	70	37
Do. do. 6 ft.	7	11	11
Total	261	250	247

now a word as to balling or clustering. This arises from one of three causes.

By *welding* of the shot. This is caused either by violent friction against the wad, or the turnover, or the cone, or from violent concussion from an overload. When arising from these causes it may be cured by using a softer wad, so as to provide a kind of spring to the blow. It is also caused by using too long a case in the chamber, the shot being jammed together.

By *fusion* of the shot itself. This is caused by the hot gases from powder combustion getting past the wad and among the pellets, heating them; either from too loose a wad, or from too long a chamber. A softer wad will often cure this in the first case, and a more elastic wad in the other case. The elastic wad swells out, as is shown here, on the passage of the gases.



Balling is more found with the cylinder guns than with the conical bore guns, the constriction in the latter breaking up the mass of shot at the muzzle, and producing clustering rather than balling. I have attributed sometimes to the fact that the actual bore of the cylinder is smaller than that of the choke, though of the same nominal figure."

The author of this lecture, most of which we have heard of above, delivered it before the Gunmakers' Association.

A previous lecture of his dealt with velocities and pressures, and the times taken in the barrel of Schultze's gun as against other powders. We think that as it is generally admitted by experts that a slow powder gives the best patterns, and as Schultze powder is essentially a slow powder, it is well to hear Mr. Griffith on the subject, where he will dispute his authority, and on that phase of the question where no one will deny the merit of his powder.

We are all of us aware that a porous powder must be able to fluctuate by reason of dampness or drying, and that concentrated waterproof powder is. We all know that the rate of ignition is enormously affected by dryness.

or dampness, and yet, in practice, Schultze powder, which is porous, holds its own. The reason of this is that the highest ideal—a powder independent of the varying power of the detonator—has never been reached in nitro powders. Black powder is independent of this influence, nitro powder is not. Its smoothness of shooting is caused by its delay in igniting. For this reason the powder-makers are at the mercy of the cap-makers, and every time a shooter puts a cartridge in his gun he puts in enough powder to do an



MR. R. W. S. GRIFFITH.

injury to his gun if only it is ignited simultaneously. We speak thus of all nitro powders, not of one alone. Some time ago there was a powder put upon the market which, in the cases prepared for it, was said to give no more than a ton pressure to the square inch of the internal surface of the chamber of the gun—that is about a third of normal pressure; and yet the velocity of the shot was said to be as good as that from other powders. This was Van Forster powder. It has disappeared, and although it was a low

ssure powder, the statement was absurd. It was evident that this powder depended for its low pressures upon its slow ignition, not upon its slow combustion. Ignition to be slow means that all the grains are not ignited by the flash of the cap. Combustion to be slow means that each grain takes a length of time to burn through. Schultze powder depends upon the former for its slow action and low pressures accompanied by high velocities.

The ideal powder is not yet made. It would, and probably will, be one in which each grain is ignited by the cap, and when ignited burns slowly, not diminishing its exposed burning surface gradually, but suddenly going out nothing near the muzzle. Besides these qualities it must be absolutely waterproof—in fact, a solid. In order to keep a regular superficial area exposed to the fire all up the barrel, it is obvious that it cannot be spherical. It must be of the form either of flakes or of tubes. It is curious that no powder-maker has given us anything of the kind yet, although we are not sure that they have attempted to do it. It is obvious that if all of the surfaces are ignited at the same time the thickness through of each separate mass, or mass of the load must be greatly increased beyond anything that has hitherto been used for the shot-gun. When this has been done we shall, we believe, get much greater velocities from our shot-gun than are dreamt of now.

But speculation of this sort has but little interest; the point is: Which is the best and most reliable powder at this moment? We are not prepared to answer the question; our own personal liking has very little to do with the matter, for we find that sportsmen equally competent to judge are much divided in opinion. This, however, is certain, Schultze was the first nitro powder to please sportsmen, and it has improved every year since its first production in this country.

Mr. Griffith lives in a pretty little house close to the Schultze Company's works in the New Forest. He is a regular licence-holder for the forest, and kills his fair share of the forest game, mostly pheasants. This kind of shooting necessitates walking and a good dog or two, and that they

have long known what a really good dog means in the forest is a fact. We discovered it to our sorrow twenty-five years ago, when Captain Venner defeated all the crack field trial dogs at the field trials held near Southampton.

Mr. Griffith was the first to apply the principles of measurements adopted for big guns to the shot-gun. We need hardly say that we have not always been able to agree with his methods, as the measurements applicable to a single projectile require a good deal of catching and adapting before they can be applied to a scatter gun and its 300 projectiles. Still, whatever shot-gun measurements our contemporary the *Field* has set forth during the past ten years, it has mostly relied upon Mr. Griffith for them, or for the initiative and the methods.

CHAPTER XVII.

HIDDEN DANGERS IN THE SHOOTING FIELD.

Internal Pressures in Gun Barrels.

ON occasion has arisen, we have always expressed opinion that too much reliance could not be placed on crusher gauges in shot guns, and that at best they were capable of giving only comparative results, not absolute measurements. If one thing more than this brought us to that opinion, it was the very low pressures constantly being published in the *Field*. For we found that from similar powder, cartridge cases, shot, and wadding we could not get such low pressures (to give equivalent velocities), and we concluded before that the methods of testing with similar arguments were sufficiently different to obviate agreement. We noticed with surprise that the *Field's* experiments with Van Forster powder gave results as low as a ton per square inch with regulation velocities, and of about $2\frac{1}{2}$ tons per square inch, such as are required with most, we might say all, powders, to ensure the velocity required in the shot. Yet Van Forster's powder had barely obtained its testimonial as absolutely the best powder that was manufactured (according to pressures and velocities) than it died out entirely and was no longer heard of. We can safely say that if the experiments had been reliable we should have been able to shoot much larger charges of powder and a smaller amount of less-shot without a loss of velocity at the longer distances. Those who knew anything of ballistics were aware that there must be a screw loose somewhere, as it was obvious that a ton per square inch pressure at the

chamber was not enough pressure, however sustained up the barrel it might be, to give a muzzle velocity of 1,000 or 1,200 feet per second.

Another time when the published records of the *Field* struck us as very much too low was when Kynoch's brought out their new powder. Then the Press paid a visit to the company's works, and it was found that the *Field* had succeeded in getting very much lower pressures than the company could show from their own powder, velocities being equal.

At that time Mr. Max Baker was a visitor at Kynoch's, and possibly what he saw there led him to investigate the course of procedure of the *Field*, which was apparently leading sportsmen into a fool's paradise with a sense of false security whenever any new powder came out.

He apparently discovered that the *Field* had been using the same crusher gauges that are common to everyone (those made by Messrs. Eley Bros.), but that they had continued to use an obsolete table to read them by—one that they had employed to read crushers made years ago by Cogswell and Harrison. This was denied by the *Field*, and whether it was a correct denial or not, the same course of misleading trials for pressures has been since continued by it. We do not think that anyone would have believed that Mr. Max Baker had really hit on the right explanation had it not been for the fact that the *Field* editorial pen was straightway so greatly agitated as to make itself a laughing-stock. It would hardly be believed possible that the person who is responsible for such serious work as the trials, on which, to some extent, shooters rely for their safety could pen such a letter as the shooting editor of the *Field* sent to Mr. Max Baker. Wherever it is read, we think that sportsmen will agree with us, that it is the most childish effusion ever heard of. Let them judge for themselves.

“ EAST VIEW,

“ WEALDSTONE, MIDDLESEX.

October 14, 1898.

“ To the perpetually grinning fat boy, editor of the little trade-paper, *Arms and Explosives*.

“ What do you think of the slap in the face you get in this week's *Field* ?

“ As the King of Utopia said, referring to the journalistic scum with which he was surrounded, ‘ The poor devils must live.’

Signed,

“ HORATIO PHILLIPS.”

The “slap in the face” referred to was simply a denial that Mr. Max Baker had hit off the right explanation, and there was no attempt whatever made in that paper to explain the too light pressures, according to the readings of everybody else, with the same make of crusher gauges.

At the same time we should not have believed the *Field* staff capable of such childish work had it not shown us of what it was capable in that direction by the letter we have quoted. That exhibited a very angry writer at the least, and if the charge was erroneous there was no cause for anger.

But what struck most people to whom we have talked on the subject was the total absence of dignity, if not self-respect, in the occupant of the chair at some time occupied by the late Mr. Walsh (“Stonehenge”). For the latter was for years personally responsible for all the gunnery experiments of the *Field*. He brought the paper, and especially its gun department, into some respect, a respect that his memory would have enabled to cling to it even now had its present officials refrained from writing letters and publishing records of their experiments.

Mullerite Powder.

Even worse discrepancies arose shortly after this. This time it was another foreign powder that came in for the most fulsome praise, and strange to say, nearly

simultaneously, we, besides several of the ammunition trade, including Eley's and other cartridge loaders, independently and unknown to each other, tried the powder and obtained similar results, to each other, but results absurdly different from those of the *Field*. The trade trials were reported in *Arms and Explosives*; thence we extracted them to reprint in juxtaposition with those of the *Field*, and at the same time we gave our own results, made at two different times and places, and in the presence of two different sets of witnesses.

The general outcome when the results are excavated from the mass of figures in which they are embedded is that the *Field's* report shows the powder to give lighter pressures (for equal velocities) than any other powder in the market by about two-fifths, whereas all the other trials brought it out a high-pressure powder, and our own trials showed it to give pressures at least two-fifths above the average of other powders, and considerably higher than any other in the market. In *Land and Water* of June 17th, 1899, the whole of these trials are set out in full shot for shot. We now content ourselves with giving the average results of each set of experiments, and divesting all of them of the mass of figures.

MULLERITE POWDER TRIALS.

		Mean Velocity over 10 yards in Foot-Seconds.	Pressures in Tons per Sq. Inch.	
			At 1 in. Plug.	At 1½ in. Plug.
No. 1 Powder	<i>The Field's</i> records - -	1,175	1·77	Not taken
	<i>The Trade's</i> records - -	1,212	3·013	2·809
		Mean Velocity over 20 metres.		
	<i>Land and Water's</i> records -	1,055	3·247	3·021
No. 2 Powder		At 10 yds in Foot-seconds.		
	<i>The Field's</i> records - -	1,186	2·52	Not taken
	<i>The Trade's</i> records - -	1,152	3·178	2·660
		Mean over 20 metres.		
	<i>Land and Water's</i> records -	1,050	3·891	Not taken

That is the record of the two powders made by the two experimentalists. It will be noted that two of them very nearly agree, whereas the *Field* failed to discover, or to expose the dangers of this powder; even though it applied the heat test it failed to get high pressures, although everybody else obtained them under normal conditions without any artificial drying of the powder. And when it is considered that Mullerite is a condensed powder, and that a cartridge case will hold only two loads of it, besides its full shot and wads, the danger of its use without a caution as to its true pressure is obviously greater than if it were a bulk powder.

In these trials the variations of pressure obtained by us were 1·428 tons for No. 1 powder; in that of the *Field* 1·42 of a ton; in that of *Arms and Explosives* 1·42 of a ton. Whereas 1,186 f.s. was the highest velocity obtained with No. 1 by the *Field* over 10 yards, after drying the powder for twelve hours at 120deg. Fahr., *Arms and Explosives* obtained 1,212 f.s. over the same distance without drying, and we obtained a still higher velocity, as the 1,055 f.s. over 20 metres represents about 1,270 f.s. over 10 yards. The pressures do not correspond to these higher velocities, but are greatly in excess of what ought to be expected. The 1,175 f.s. velocity obtained by the *Field* without drying only gives a pressure, according to it, of 1·77 tons, whereas the 1,055 f.s. obtained by us gives a pressure of 3·247 tons. owing for the heat of the day when our trials were made, this ought to be very much more than compensation for by the twelve hours of drying given by the *Field* at 120deg. Fahr.; and yet this drying, according to us, only raised the pressure to 2·03 tons.

In reference to the attitude of the *Field* in this matter, *Arms and Explosives* challenged it to an impartial test of the powder as follows:—

The *Field* has publicly stated that Mullerite powder is the best it has ever tested and reported upon, as shown by its own figures. We invite our contemporary to prove that its own figures are the

correct ones according to the recognised standards of testing. If they are, Mullerite is a good powder. If ours are correct, Mullerite is by no means extraordinary in some points, and bad in at least one very important one.

"As the guide, philosopher, and friend of the sportsman, our contemporary gives him much advice; but in the case of our contemporary's article upon Mullerite we have reason to believe that authorities equally as competent, and certainly not less practical, are in serious disagreement with the opinion so strongly expressed by the *Field*. In the ordinary way our contemporary discourages anything in the nature of public tests, and this is carried so far that even the person most interested is ordinarily not present at the trial, though possibly his wishes may be met by being allowed to see the results after they have been taken, and before their publication. In an exceptional case, like the present, we think our contemporary would be well advised if it once and for all publicly demonstrated the theoretical and practical correctness of its own methods of testing, and we have not the slightest doubt that a committee, consisting of six of the most competent men in this work in the country, would be willing to give their assistance in the matter. The tests with Mullerite would form an excellent groundwork for such an investigation. The *Field* declares the mean pressure at 1.77 tons, we declare it at about 3 tons, and there is not sufficient divergence in the matter of load to account for any substantial part of the difference."

Land and Water did not take quite the same line. It had a lively recollection of the Pigmy cartridge controversy, and was well aware that the *Field* would not bring the matter to an impartial test and stand or fall by the results. Its quarrel, as such, with a rival journal can be of no possible interest to shooters or anyone else; but the cause of the quarrel is the safety of shooters in sport—in the first case dangerous balling of shot, and in the second dangerous pressures, both of which the *Field* failed to expose; preferring, as it did, in the one case, to attack us for exposing the danger, and in the other to sling mud at Mr. Baker in the "Utopian" style quoted above. Perhaps, then, we shall be pardoned if in a review of the latest developments of shooting we treat the matter as of importance. For these reasons *Land and Water* published its views on the booming of Mullerite in

a leading article on June 17th, 1899, and we now reprint this article :

THE SPORTING PRESS IN RELATION TO SPORTSMEN.

" We have from time to time been obliged to utter a protest upon the neglect of a portion of the Sporting Press to fulfil its expressed intention of standing sentinel between the manufacturer and the sportsman, protecting the latter from exaggerations, misrepresentations, or counterfeits, and seeing that the former is not injured by ' that lying jade ' interested rumour. On the last occasion it was what we found to be dangerous short cartridges that a contemporary had puffed and allowed to be puffed in its columns, against which we protested. A later case has come to our notice in which, if the same newspaper—the *Field*—is honestly served it is grossly misinformed. It has, in fact, again lent itself to the puffing of ammunition which it was its bounden duty to caution its readers against, if our own experiments are worth anything whatever. In this case our contemporary, at the head of which stands a family of well-known sportsmen, who knowingly would do no wrong, has made some experiments of a foreign gunpowder known as Mullerite No. 1 and No. 2, and it has given these powders the highest of praise, especially in regard to safety; that is absence of high pressures within the barrel. On Monday last we repeated these experiments, and we were astounded to find that whereas the *Field* has set out Mullerite No. 1 as a powder giving only a pressure of 1·77 tons per square inch, we obtained an average pressure of 3·247 tons per square inch, or very nearly double. Consequently when we went down to the championship meeting of the I.B.S.A. on the following Tuesday, and there met most of the representatives of the powder and ammunition trade, we were not astonished to find the extraordinary pressure reached by this much-belauded powder, and the more extraordinary figures in our contemporary, the general subject of opprobrium. This was the result not of one or two experiments being adverse to those of our contemporary, but the whole of the trials—and there had been many—were confirmatory of our own and adverse to the *Fields*. One manufacturer has gone so far as to write a letter that was shown to us, showing that after driving off all that was volatile by drying, he had actually obtained over 7 tons per square inch in the chamber of a 12-bore. No doubt it can be said with fairness that it does not do to rely upon the trials of rival manufacturers, and this is so; nor do we rely upon them in making these remarks: they merely go to confirm our own experiments, made independently of them, and we trust they will assist to show our contemporary that if newspapers of the class of itself and

ourselves are to hold their positions in the world of sport, much more care must be exercised in future.

“ In another column we print to-day the *Field's* report of this Mullerite, side by side with that of the trade paper, *Arms and Explosives*. We have no hesitation in saying that the trade paper is right and the gentleman's paper is wrong. This is a very serious matter for sporting newspapers. Are sportsmen to go in future to trade journals for information of a technical nature? Are these papers to usurp the place long occupied by another class of newspapers? We suppose that the sole object of a trade paper is that of being a reliable medium between the English wholesale manufacturer and the retail sellers, and we might naturally expect such a paper to take the side of its supporters, if honestly permitted, and condemn, in their interests, a foreign brand, or to ignore its existence, with some degree of delight. On the other hand, what is expected by gentlemen of their newspaper is somewhat different. They do not pay their sixpences with the object of being beguiled into buying that which is worse, even if the manufacturers can make more profit out of it. On the contrary, they, being well aware that a large part of the revenue of a newspaper comes from its advertisements, expect to see all honest endeavours to better meet their wants set before them; and if we know anything about the matter, when one paper descends to puffing without proper care of the interests of sport, the whole of that class of newspapers to which it belongs suffers in reputation; to be followed with absolute certainty, sooner or later, by more material loss. This is so, much more than would otherwise be the case, when the offender is the oldest established of the lot—and it is for this reason that we notice what appears to be a gross blunder of some sort in the *Field*, when we should have passed it by in a juvenile contemporary. We are absolutely assured that we shall be as much sufferers as the *Field* will if this kind of thing continues, as it has continued for some time.

“ It appears to us to be asking too much of readers who pick up papers indiscriminately and read any article that amuses them to remember in which paper they saw this, or that, misleading mistake—the whole class suffers by such work. Even within the last few weeks we observe Mr. Lancaster has been advertising to sportsmen the opinions of a trade journal in the columns of the *Field*, to the extent of a whole column of its space. If that does not open the eyes of our contemporary to the lessened value of its own opinions, we do not know what will. It is only a question of a few years, if things go on as they are now, when the weekly Sporting Press will no longer be the medium between manufacturers and sportsmen. We see plenty of indications of this kind, all tending that way, and those can only be met by the strictest impartiality and the utmost care.

“What we particularly find fault with about this Mullerite powder is that the *Field's* report made it out a lower pressure powder than any in the market, whereas, it gives, under normal conditions, the highest pressures of any powder on the market, and we think that if a summer's day could make a difference of nearly half to the pressure, the heat tests applied by the *Field* are a great deal worse than useless, and that it would be far better in the interests of shooters to make no reports than misleading ones, and far better for newspapers in general also.

“Leaving the particular instance, to come to the general state of journalism, we may remark there is no doubt that the most easy-going newspapers,—those which will most readily adopt the views of traders—are necessarily in the strongest advertising position. Traders naturally say, ‘What is the use of our advertising if you editorially condemn what we advertise?’ They have said it to us scores of times, and this Mullerite powder is no exception to the rule.

“We have constantly been asked to put in notices of traders' wares, written in editorial form by the traders themselves, as the most natural thing in the world; and we are well aware that where this method of doing business is practised by newspapers, the advertisements follow as a natural consequence, for a time at least, and until traders have found out that the trick has been discovered by their customers, and the papers which practise it have, as a consequence, lost their reputations for ever. At present we say no more, and it is not our intention at this time to identify those papers that resort to such practices; but they exist, and in the interest of the whole class to which they belong, they must mend their ways, or else they will find themselves exposed by a very powerful combination of those journalists who (like Lord Russell's trading correspondents) for choice prefer to be honest if it pays equally well, and by others who prefer that course whatever the result may be.”

BALLING SHOT FROM SHORT CASES.

A danger even greater than high gas pressures, with their tendencies to burst the barrels, is the balling of the shot. We cannot say that short cases in ordinary chambers are the only cause of balling. Even as long ago as the days of muzzle loading Col. Hawker records the “extraordinary circumstance” that he blew off the head of a bird at seventy-two yards distance; so that balling did occasionally take place before guns had cartridges or cartridge chambers. But we have shot some thousands of rounds at plates, and never got

a ball until we tried Mr. Lancaster's short cases, which he called Pigmy cartridges, in guns of ordinary chambers. It is certain, therefore, that balling in ordinary guns, with ordinary load, is very rare indeed; but it is not rare with 2in. or $2\frac{1}{4}$ in. cases in $2\frac{1}{2}$ in. chambers. On the contrary, it may be expected. Messrs. Nobel have issued Ballistite powder in short cases, and they found that with a hard wad the shot constantly balled, whereas with a soft wad it did not. We tried these latter, and found no balling, at the same time that we were getting balling from Mr. Lancaster's cartridges; but at the same time the penetration was very low. This clearly proved that there was a material escape of gas past the powder wads into the shot. The curious part of the business is that a small escape of gas seems more likely to cause balling than a larger one does. In our view this is because a large escape blows the shot about in such a manner that they never again touch each other within the barrel. Thus it has been found by Mr. Watts, of the London Sporting Park, that sometimes a 2in. cartridge will not ball its shot when used in a 3in. chamber, whereas a $2\frac{1}{2}$ in. cartridge in the same gun will do so. We were present when Mr. Watts fired some cartridges of various lengths into water from above and caught the pellet. In two cases out of four with short cases there was distinct evidence of fusing. The graphite covering had been melted off and the lead was white instead of being black. Added to this there was evidence of great pressure upon the pellets one against the other. Thus they were mostly converted into six-sided objects and were no longer spheres. Yet there was no such thing as shot sticking together when found in the water; and this is probably accounted for by the shock the charge receives on striking the water; and this explanation seems to be the right one, for the reason that it has already been proved that choke bores ball far less frequently than cylinders do. It seems that the shock the tight muzzle gives to the shot is enough to break them apart after they have been stuck by pressure or by hot gas, or, what seems more probable than either, by both acting together.

It has been said that powder pressures, if very sudden.

will cause the shot to ball. And some concentrated nitro-powders have been blamed accordingly. But there is no

ILLUSTRATIONS REFERRING TO EXPERIMENTS FOR DETECTING THE REASONS FOR BALLING OF SHOT.



·816 ·807 ·805 ·804 ·8045 ·803 ·757

The right chamber cast which does not ball Pigmies.



·816 ·807 ·805 ·804 ·8045 ·803 ·761

The left chamber cast which balls Pigmies.



The three-inch chamber with abrupt shoulders, cast of the Purdey Pigeon Gun, which does not ball its shot.

concentrated nitro as sudden in its action as No. 2 black, and this powder does not ball shot from an ordinary length car-

tridge and chamber. Then there have been many silly reasons put forward, one of which is that an abrupt shoulder to the chamber is the cause of balling. The answer to this is that up to a few years ago all shoulders were abrupt, and balling was as rare as it is to-day from proper cartridges.

It was stated that abrupt shoulders to chambers would cause balling in any gun, whether the cases fitted or whether they did not, and that the modern and improved method of chambering guns was to graduate the chambers into the barrels in a very long cone. Now, we happened to know one of the crack makers was going the other way and was making chambers far more abrupt than of old, and yet his guns do not ball with the proper length of cartridge. Moreover we found we possessed a pair of barrels that were very nearly alike in the chambers, illustrations of sulphur casts from which we give, one of which balls terribly with Pigmy cartridges, and the other shoots them moderately well.

The sulphur casts we have had photographed exact size. The two first are also measured, but the latter had to be returned to the owner before we obtained the measure of it. In spite of this abrupt shoulder it is said to throw the best pattern of any gun that has ever been tried at the shooting school. And, in fact, the cast was made in order that other chambers might be bored to it. The two long casts, on the other hand, have very sloping shoulders, and yet one of them balls badly with short cartridges, and the more abrupt shouldered one of the two does not.

Again we mean to trespass on the patience of readers by quoting from *Land and Water* a reply to an attack by the *Field*, which challenged the motives for the publication of the trials of short cartridges. As this reply is itself a severe criticism of the *Field*, it might be expected that it would have called forth a disclaimer or an answer of some kind; but although published on November 19, 1898, no answer had been forthcoming up to August of 1899. In fact no answer was possible. The *Field* gave itself away. We suppose that it did not know that we were aware of its suppressed trial of Pigmy cartridges.

THE FIELD" AND PIGMY CARTRIDGES, PUBLISHED IN "LAND AND WATER" ON NOV. 19, 1898.

"MR. H. CUMBERLAND BENTLEY has addressed a very sensible letter to the *Field*, in which he reminds those who have written extolling the shooting qualities of short cartridges that they are talking away from the issue, because the question of danger is not thus to be settled. We had better quote Mr. Bentley in full, because we have something to say on the side issues raised in an editorial footnote by the editor of the *Field*.

"SIR,—It is ludicrous to read the amount of ignorance displayed by shooting correspondents with regard to short or 'Pigmy' cartridges. The question under discussion is *not* if these cartridges will kill well, but if they 'ball' sufficiently *so as to be more than ordinarily dangerous*; and this I believe I am not wrong in stating has been conclusively proved in various trials by the ————— [We purposely omit the name of the paper.—Ed. *Field*.] as well as more recently, if not so conclusively, by yourselves.

"Surely there are enough dangers in covert shooting without this new terror stalking in our midst, and putting a further fear of death into us. The beater is worthy of his hire; why, then, drive a hole through him that would stop a rhinoceros? The ordinary host has no particular craving to turn his covert shoot into an Omdurman; and he has enough luxuries to provide, without being obliged to add an ambulance and staff to the already lengthy list.

"If these 'Pigmies' do 'ball,' it rests with every host to prevent their being used by his guests. It also rests with Mr. Lancaster, as a sportsman as well as a gunmaker, to clear this matter up, once and for all, and so remove a daily and growing apprehension from our minds.

"H. CUMBERLAND BENTLEY."

"To this letter the following Editorial Note was appended:—

"[Has our correspondent had any personal experience of short cartridges, whether 'Pigmies' or otherwise? And has he found them to be 'more than ordinarily dangerous'? If so, we shall be much obliged if he will send some of the cartridges, together with the gun in which they balled; and we will then endeavour to ascertain whether the fault lies exclusively in the cartridges, or if there is any defect in the boring of the gun, or whether the results are due to a combination of demerits. We are not aware that these cartridges have been 'conclusively proved' to be dangerous by anyone—certainly not by ourselves, or we should unhesitatingly have excluded their advertisement from our pages, whoever were the manufacturers. But the causes of 'balling' are numerous, as will be seen by those who

read the lengthy article on the subject given in our present issue; whereas, if the pernicious habit of balling were solely due to the cartridges, and occurred in the generality of guns, evidence of the fact would be much more readily forthcoming than it really is. Mr. Thorn (the pupil as well as the business successor of the late Mr. Charles Lancaster) recently informed us that he had sent out nearly a million of the 'Pigmies' during the present season; and we can quite believe his statement after seeing the immense number of letters which he laid before us, showing the renewed orders for hundreds and thousands of cartridges, written by sportsmen of high rank as well as commoners, and expressing their opinions of those previously received. If Mr. Cumberland Bentley would call at 151, New Bond Street, we have no doubt Mr. Thorn would willingly show him those letters; and he might also supply some evidence as to the value of certain criticisms which have been published elsewhere. We have heard a good deal of late about 'blackmailing' proceedings, and it is apparent that from these the sporting Press is not altogether free, so that it is desirable to take some printed assertions *cum grano salis*.—ED. *Field*.]

"It is, we think, a great pity that the editor of the *Field* erased the name of the paper which Mr. Cumberland Bentley mentioned. We fancy that had he not done so he would not have cared to father the irresponsible excuses that Mr. Lancaster elects to offer, in order to explain the failure of his cartridges to perform with even moderate safety in the hands of other experts than him of the *Field*. There is no valid excuse for the failure of these cartridges, and their extreme danger has been exhibited—not in a private ground, where nothing can be checked by outsiders, such as the *Field* adopts for its trials, but in a public ground, where there was no secret as to what happened, and where there were witnesses to go into a court of law, if need be, to say what had happened. But the *Field* is the last sporting paper in London that should give utterance to mere reports of blackmailing such as cannot, under the law of libel, be repeated as a plain statement in black and white. If we were, any of us, to be judged upon unbacked reports from which the authors would run away: if we were, any of us, to set about hinting at things that we could not substantiate in a court of law, then the *Field* would have every reason to cry out that we were hitting below the belt. As it is, the least we can do, and the most we will do, is to ask our sleepy contemporary to try and discover the beam which is in its own eye before indulging in the use of Mr. Lancaster's spectacles to try and find the moat in another's.

"But this dark hint by the *Field*—this advice to Mr. Cumberland Bentley to go elsewhere for a secret report against the character of other papers is too contemptible. We had occasion last week to say of

at journal that up to the time of the writing of a certain letter by shooting editor, if it had not always been dignified, yet it had never been impudent. Then we withdrew that opinion on the publication of its letter to *Arms and Explosives*, which began 'To the perpetually grinning fat boy.' That letter was the result of an answerable criticism made by *Arms and Explosives* against the accuracy of the *Field's* gunnery experiments. These are just the class of experiments that, incidentally, and without mentioning them, are challenged by the condemnation of Mr. Lancaster's Pigmy cartridges by us and others. Why, and how, we are about to explain.

"When we first wrote to Mr. Lancaster that we had had some very bad balling with the cartridges that he sent us to try, he brought down to us a heap of testimonials and orders for cartridges from sportsmen, none of whom seemed to have tried them at the plate, with one exception; that one was that of the *Field* shooting editor. Now, why was that report never published? It referred to cartridges loaded with $1\frac{1}{2}$ oz. of shot such as we had then just tried and condemned. Yet the *Field* now takes credit to itself for never having published a report recommending the cartridge until they had been reduced to 1 oz. of shot.

"We suppose our reports are included under the caution given to Mr. Cumberland Bentley. But why is he recommended to take his condemnation of the $1\frac{1}{2}$ oz. load *cum grano salis*, when the *Field* flatters itself because it did not recommend the very things he condemned? It is stroking out its ruffled plumes on very scant authority, we think. If the *Field* is worthy of self-congratulation, such as it gave itself last week, for declining, after trial, to notice the cartridges we condemned, on what grounds does it question our condemnation of those selfsame cartridges?

"The load of 1 oz. as applied to Pigmy cartridges followed our report, it did not precede it. We have never tried Mr. Lancaster's cartridges with 1 oz. of shot, and have repeatedly said so, for the simple reason that he declined to send us any for trial. But we have got a lot of his $1\frac{1}{2}$ oz. cartridges still, such as the *Field* tried and did not report upon, in spite of the fact that they were being sold all the time; and we can show balling with them any day. We may say also that others have found balling with his 1 oz. loads, and we say of them all exactly what we said of the $1\frac{1}{2}$ oz. loads—that no one should use them in sport without first plating his guns with a large quantity of test for balling. This is all we urged against the $1\frac{1}{2}$ oz. loads. Will the *Field* say that sportsmen should take these cartridges on faith without trial at the plate? It will not, and has not, and we dare it to do so. What, then, becomes of its absurd caution to take its rival's more outspoken reports *cum grano salis*?

"Its answer to Mr. Max Baker's criticism—that it had been for three years using obsolete tables of measurement with new tools, to which they did not apply—was simply childish and impudent. Its attack on its rivals for condemning Pigmy cartridges is worse than childish, because at the same time it plumes itself for not recommending them in the state in which they were condemned.

"It should not forget the only sporting paper of any standing to which Mr. Lancaster pays anything for advertisements is the *Field*. It should not forget the many answers to Mr. Hooley's charge of blackmailing, for it might be necessary to inquire how it happened that there was no adverse report published by it of Mr. Lancaster's cartridges when there ought to have been one. It cannot say it did not try them, we saw the written report; it cannot say they were not then a danger to the public, for the latter were using them largely, and the maker withdrew them publicly.

"If the *Field* elects to attack our report, we reply that it is in a false position, only equalled by that of Mr. Lancaster. He felt aggrieved at our condemnation of cartridges, although he wrote to *Land and Water* to say he had withdrawn them from the public. The *Field* also tried these cartridges; reported to Mr. Lancaster, but not to the public, upon them; yet it declares others who did publish their results should be taken *cum grano salis*, in spite of the fact that it expresses so much self-satisfaction for not recommending them at that time, nor until they had been reduced to 1oz. of shot, and also in spite of the fact that Mr. Lancaster made a boast in *Land and Water* of having withdrawn the cartridges from the public. Is not the withdrawal by the maker sufficient proof of badness for the *Field*? It cannot be so unless it is also complete exoneration of us for our condemnation.

"Instead of reporting, it seems to have urged Mr. Lancaster to load only with 1oz. of shot. Why? Had it read our report in which Cannonite powder with 1oz. of shot did not ball in spite of the short cases and long chambers?

"Will the *Field* tell us the object of its three columns of reasons for balling in its last week's issue? Is it not to lead the shooting public to think that balling is a common thing, and that therefore, when Pigmy cartridges are found to ball, they are to take it as an ordinary accident common to many guns, and possibly having nothing to do with the cartridges at all? If that is the reason we can only say that it is a very bad one indeed. We can tell the *Field* that balling is a most uncommon event with ordinary guns and ordinary cartridges, and that when there is balling something is radically wrong, and they need not measure the

chambers to find a $\frac{1}{1000}$ of an inch inaccuracy when cartridges are half an inch too short for the chambers.

"We think before the *Field* takes upon it to advise Mr. Cumberland Bentley it should at least have a sportsman on its shooting staff, and then it would know when it got a letter that deserved attention. Mr. Cumberland Bentley knows probably more than he says in that letter: He is well known, not only as a game shooter, but also as a pigeon shot at Hurlingham, and the latter implies that he knows how to plate a gun and does it.

"It was in November, 1897, that we discovered the balling of the Pigny cartridges. It was then that we saw the *Field's* written report of them to Mr. Lancaster, and it was not until the following May that the *Field* published a favourable notice of the cartridges. This we gather from the *Field* of last week, for we were not before aware that the early report that we saw had not been published.

"We do not desire that the *Field* should adopt a higher moral standard than it does. Their moral standard is nothing whatever to us, but it cannot afford to talk of blackmailing by other newspapers and to turn itself into a journalistic Hooley on its present reputation for high moral rectitude. Let us see how high its aspirations soar, and how its clipped wings fail to accompany them. If, it says, these cartridges of Lancaster's, or any other firm, were proved dangerous, the advertisement 'would be excluded from our columns.' Would it really? How comes it then, may we ask, that the advertisement of the 1½oz. cartridges appeared in its columns between November of 1897 (when it had privately tried these cartridges and declined to publish the report of them) and May, 1898, when it first reported on them in their changed form of 1oz.? We have no doubt that plenty of reasons will be forthcoming why this high moral rectitude has been allowed to slumber for five or six months at six or eight guineas a week, or whatever the cost of the advertisement is.

"We have nothing to do with the *Field* newspaper; it does not come to us for review like the 'Encyclopædia of Sport,' and its doings would escape our attention entirely did it not go out of its way to do us injury by dark hints (such as its accusation of booming the one-trigger gun), to which it dare not put a name. Now we have done what we can to induce it to put a name to anything it is able to say. We propose to go further in that direction, for we are convinced that the more the question of blackmail is thrashed out the better it will be for *Land and Water*, and the more that unholy bird will go home to roost.

"Still, with this end in view, we propose to tell a little story that may interest the sleepy editorial chair of our contemporary. When the shooting article of the 'Encyclopædia of Sport' was done by Mr.

Phillips, the shooting editor of the *Field*, by far the better portion of it was devoted to two inventions of Mr. Phillips's own. Those were the twin-trigger gun and the Vena Contracta. The publisher of the book followed up this notice by an apology to the rest of the gun trade, and a request for information, in order to supply the deficiency. When Mr. Walsh, the late editor of the *Field*, invented a gun he said so publicly, and no one was taken in by his recommendation of his own wares. He believed in his gun, and it was no detriment to him, as a man or as an editor of a newspaper, that nobody else believed in it. But how does the present staff follow those traditions? We have already referred to the *Field's* dark reference to ourselves (without putting a name to it) as boomers of the single-trigger gun. Would it be believed that the *Field* staff had then set to work to try and supersede the single-trigger by an invention of its own, and that this invention was afterwards noticed for its superiority by the *Field*; and that this was done on May 1, 1897, without then disclosing the fact that it was the outcome of the gun-trade within the *Field* office itself?

"Those are the facts. The improved twin-trigger gun, the invention of Mr. Phillips of the *Field*, was thus noticed in the *Field* without acknowledging the bantling as their own. Possibly it may have been acknowledged at some other time. This was followed, as we have already said, by a similar notice of the Vena Contracta gun and the twin-trigger in the 'Encyclopædia of Sport,' in neither of which notices is it stated that the writer of the articles is also the inventor of the gun noticed.

"We read in the 'Encyclopædia of Sport': 'The Vena Contracta is another type of game gun that is rapidly coming into favour in consequence of its extreme handiness, strength, and lightness. It was introduced by Joseph Lang and Son in 1893.' This was written four years afterwards in 1897, and as a matter of fact the statement that it was rapidly coming into favour was untrue. We have nothing to say against the invention, but we say this, that the gun is absolutely out of favour, and has never been in favour, growing or otherwise.

"Having stated a few of the unsavoury morsels that are well known in the gun trade about the *Field*, we trust we may hear from it all that its dark hints are intended to convey. There is only one thing in which we can join with the *Field*. Its advice to Mr. Cumberland Bentley to go to Mr. Lancaster for the reasons why his cartridges have been condemned in other prints than the *Field* is admirable. We trust Mr. Bentley will act on the advice and report in *Land and Water* what he hears there. If he will do so, we undertake to publish his letter in full and to hold him harmless in the matter, no matter what dealings of whatsoever papers may be challenged by Mr. Lan-

easter as an excuse, or explanation, of the condemnation of his Pigmy cartridges.

"Failing this, we have said more than anyone else against these short cases in long chambers. If we have exceeded the bounds of fair play, we are here to defend an action at law if need be, should Mr. Lancaster think himself or his business unfairly treated by us. The question is, can the results we published be challenged? Can it be denied that we had three consecutive shots, all of which balled, and made splashes the size of a halfpenny to a penny, from three different chance guns? If that cannot be challenged, and it never has been challenged, although first published in March last, what is the use of talking about the reasons for the publication of those results?

"The shooting public had the benefit of all we knew about Pigmy cartridges. The *Field* cannot say as much. We do not seek for their reasons. The facts are all too obvious.

"*Since writing the above article Mr. Cumberland Bentley has been good enough to call upon us, and at our request to tell us that the paper he mentioned in the letter we reprint from the 'Field' was 'Land and Water.' He has, moreover, placed at our disposal a copy of his reply to the editorial note appended to his letter in the 'Field' last week. It is as follows:—*

"[COPY.]

"The Editor of the *Field*.

"SIR—I consider the trial made by the paper quoted, whose name you *purposely omit to mention*, to be *quite sufficient proof of short cartridges balling in some guns, if not in all, not specially chambered for them.*

"As you, however, do not appear to think so, and hint at *black-mailing*, I give you my own experience, such as it is worth.

"I tried short cartridges out of a pair of cylinder Purdey guns, and found that the pattern scattered all over the plate, and occasionally balled, the balling generally being quite at the outside of the pattern.

"At a shooting school not far from London I was, last summer, pointed out targets said to be riddled by the balling of short cartridges.

"During the past week I have talked the matter over with three leading London gunmakers, and their opinion in every case was *adverse* to these short cartridges.

"Testimonials, I consider, go for very little. Out of a man's entire shooting acquaintance, do you suppose there are a dozen who

ever *plate* their guns ? As long as their cartridges appear to kill well they are perfectly satisfied.

“ My letter was only written to further the safety of the shooting public, and I shall not take any further part in the discussion.

“(Signed) H. CUMBERLAND BENTLEY.”

THE SEQUEL TO THE STORY.

The outcome to this controversy was that various correspondents wrote to the *Field* saying that they had found short cartridges ball badly, although the staff of the *Field* have never yet acknowledged being able to discover the fault ; or, at any rate, have not made public a case of balling from such cartridges. Yet the fact does not require very much discovery. Mr. W. W. Watts, of the London Sporting Park, was one of these correspondents whose letters were published in the *Field*. Mr. Watts took ten chance guns to the plate, and he fired thirty shots with them. Nine of these ten occasionally balled their shot, and out of the thirty shots fired there were ten balling rounds.

It may be asked, “ What is the nature of these balls when they do occur, and how do they come to be so dangerous ? ” We do not think that the pellets are very tightly stuck together, hardly more than enough, perhaps, to resist the friction of the air as they fly through it. But when they strike a surface like a steel target at forty yards, they indent it as if a solid bullet had been fired at it, and they sometimes fly off at an extraordinary angle, and when this happens they go with force enough to go through a corrugated iron fence, as did some of those we fired at the London Sporting Park, although the bulk of the charges hit the targets fired at.

At the same time, we have never said more against the use of short cases than that every gun with which it is designed to use them should have some hundreds of them fired at large steel plates with satisfactory results before they can be considered safe to use. We do not consider experience at game with them of the smallest use in proving their safety.

Many people are quite satisfied with them at game. First, they are cheap; second, they are good enough to kill with at such distances as the majority of men are competent to shoot at, with any prospect of doing regular good work. But if regular good work is required at 40 or 50 yards, no short cartridge can do it. The loss of power is too great to permit of the best penetration at such ranges. Some people seem to have been misled by occasional extraordinarily long shots. But we would remind these of Col. Hawker's feat, already mentioned, of blowing off the head of a bird at eighty yards. The balled shot are no doubt occasionally responsible for very long kills, but what is wanted is regular shooting at the longest distances within the range of the gun, and within the competence of the man. Short cartridges in 2½ in. chambers can never accomplish the first; perhaps they can the second where the man is a moderate or third-rate shot.

Mr. Lancaster's frequent changes of make of short cartridges which he issues would be exoneration enough for anyone who had publicly pointed out that they were not what they ought to be. But every reason but the right one has been given by him for the dangerous results recorded. In an article in *Land and Water*, Nov. 26th, 1898, we tabulated the reasons set forth by Mr. Lancaster for the bad results and bad reports of these cartridges as follows :—

First, on account of wrong caps as applied to one of three different lots.

Second, on account of wrong chambers.

Third, on account of wrong barrels.

Fourth, on account of our partiality, though he failed to get his own gunmakers' association to set us right when challenged by us to a public trial.

Fifth, on account of the wrong loads (by withdrawing all the makes of 1½ oz. loads).

Sixth, and as a nine months' afterthought, on account of somebody's blackmailing.

In the same article the various makes of these Pigmy

cartridges were enumerated, as far as we knew them, thus :—

No. 1 batch ($1\frac{1}{8}$ oz.), publicly withdrawn and sent back to the makers.

No. 2 batch ($1\frac{1}{8}$ oz.), since substituted by others.

No. 3 batch, also $1\frac{1}{8}$ oz., we tried on a later occasion, but from our inquiries we find that they had been issued prior to No. 1, and on shooting them they balled worse than any we had tried.

Thus we have no less than three different makes of cartridges with $1\frac{1}{8}$ oz. of shot, all in public use, and as far as we know only one recalled after being issued to the public, *yet all now abandoned* by their makers.

These have all been abandoned in favour of loads of 1 oz. shot. It is hardly likely that these 1 oz. cartridges, as sold during last shooting season, were satisfactory either, because if they had been the last thing the vendor would have done would have been to change the makers of them since ; yet this is precisely what he has done. Thus it will be seen that, in spite of every excuse being offered by Mr. Lancaster for the shooting results of his Pigmy cartridges, he has changed the brand *at least* five times. We regard it as the vendor's confirmation of our bad report. We do not know what shooters will think about the matter. Perhaps they will think that we have occupied too much space in dealing with a trumpery affair. We should agree to that if it were only one gunmaker and his business affair. But it is not ; it is a much more serious affair. The question appears to us to be this : Are the dangers of the shooting field to be hidden by the sporting Press in order to please advertising manufacturers ?

Possibly readers of this article may, on reading the following advertisement that lately appeared in the *Times*, appreciate the satire of the *Evening News* :—

TO EDITORS AND OTHERS.

Shooting Contributor.—Wanted, by high-class London Weekly, first-class Shooting (Sporting) Contributor.—Apply, stating qualifications, age, etc.

Upon this the *Evening News* breaks forth, if not into song,
into satire.

In the wild and woolly West
It is very seldom best
To devote your time to wrangling and disputing :
For the man who takes the bun
Is most usually one
Who is handy and effective with his shooting.

There are people who may prate
Of the way to arbitrate,
Which they find of knotty points the greatest solver :
But though arguments he lack,
One must feel inclined to back
The gentleman who talks through his revolver.

Now at present over here,
Much too often, it is clear,
There's a waste of time and temper editorial,
When the business might be done
By the popping of a gun.
An inquest, and a suitable memorial.

Some will curse you without stint
When they see their names in print,
And will come around and bore you with their raving :
And to keep a man of blood,
Nipping actions in the bud.
Must effect a quite considerable saving.

When the party with a scheme
For extracting milk from cream
Will insist upon displaying his inventions,
You could hurry things a lot
With a well-directed shot,
And would leave him in no doubt of your intentions.

And in every kind of way
You would find the business pay.
You require a few revolvers and a rifle :
And if funds are rather low.
You can wire some savage show,
And they'll hire you out a nigger for a trifle.

CHAPTER XVIII.

PAST MASTERS—JOE MANTON.

WE suppose that, if asked who were the fathers of modern shooters and gunmakers, ninety-nine out of every hundred shooters would name Colonel Hawker and Joe Manton. The features of the former and his performances with the gun are well known. Of the latter little is known, except that he was the best and most unfortunate gunmaker in England. Egg was his only rival, and if he treated sportsmen as he is recorded to have treated Colonel Hawker it is no wonder that his greater rival soon outstripped him in popularity. Joseph Manton introduced a totally new era in gunmaking. So much was this the case that after his death all the men who became celebrated for their guns had been his workmen. Colonel Hawker speaks of Egg as a rascal, and it is clear that Joseph Manton had to re-bore Egg's guns before they suited the Colonel. When his bankruptcy led this celebrated maker to prison, Colonel Hawker superintended his own gunmaking at Manton's workshop and seems to have got his way in everything, so that we may assume that he was almost as much a gunmaker as Manton's workmen. Of course we do not hear the other side of the story, for neither Manton nor his workmen kept diaries as the Colonel did. It appears that Manton's patents and law suits in their defence, even in one instance against his own brother, were the ultimate cause of his ruin. In one at least of these Colonel Hawker was called as a witness to speak to the usefulness of Manton's inventions. The latter speaks of being able to "pitch" one of Manton's guns quicker than any other, so that it is fair to assume that he altered the design or style of a gun as much as he improved their mechanism.

That Manton's guns could kill is witnessed by Colonel Hawker in many a page. Sir Ralph Payne-Gallwey, who edited the latter's voluminous diary and boiled it down to the two large volumes it fills in its published state, speaks of being impressed with the absolute truth and correct observation of the writer, and yet there are some marvellous records of consecutive kills at game which, even in these days of choke-boring, would be considered wonderful. Of course, fourteen consecutive rights and lefts at partridges and fourteen consecutive single-barrel kills at snipe, such as Colonel Hawker records of himself, made with Manton's guns, depend for their merit a great deal upon the habits of the birds, and might either represent wonderful or very ordinary shooting, according to the rise and flight of the game. Snipe especially vary in this respect, and we have known one supposed celebrated snipe shot, whose reputation had been gained in August, actually refuse to shoot when put down in a snipe bog late in the year, where the birds were rising at all distances above 40 yards and making the best of their time when up. But we are constantly reading in the diary of 80 yards shots and so on, and yet this was by a man who prided himself on a long succession of consecutive kills and seemed to think the Fates were treating him spitefully if he feathered and lost one bird out of twenty or thirty he shot at. There is one thing to be said about such performances: we do not hear of them now with choke bores or without them. On September 23, 1815, Colonel Hawker writes:—"I have now completed 29 birds out of fifteen double shots. I did this with my old 22-gauge gun; last year I killed twenty-seven birds out of fourteen double shots with a 14-gauge gun; but this last is far better, as the birds require such quick shooting." As Sir Ralph Payne-Gallwey is possibly the only man who has ever read the majority of the MS. diary it is probably wise to accept his view that there never was, and probably never will be, a better snipe shot than Colonel Hawker, author of "Instructions to Young Shooters." If we allow this, what shall we say about his guns and their maker? Clearly

they must have been far above the average, not of that day only, but of this, for although a snipe comes down at a very light blow, penetration and pattern are convertible terms according to the size of the shot, and there is no doubt that to make a string of consecutive kills at snipe requires a gun that shoots a splendid pattern, or else the birds will occasionally fly away unharmed through it.

Writing September 16, 1816, Colonel Hawker says, "I have now killed sixty shots in succession and ninety-three birds, with only one miss." He speaks of thinking little of such shooting if he had picked his shots and taken only those under 40 yards, and not worked both barrels fairly. On other occasions he says it was impossible to make a succession of kills, because he had to fire at random long shots three times at least for every one that he could get within fair distance. There were balling shot upon occasion in his day, for he speaks of blowing a bird's head from its body at seventy-two paces. This shows the distances at which he shot game, although it is impossible to believe that he was in the habit of shooting at those distances when he made his long runs of kills early in the season. We remember the wheat stubbles of 1865 or thereabouts: they were better cover even than the turnips of the same period, and during September partridges required a good deal of finding in them, and we imagine that anyone who shot at long distances, even for his second bird, would have been going out of his way to do so.

No doubt Colonel Hawker was somewhat like the rest of gunners, and did not let off near shots in order to try his gun at long ranges, and if we grant this it may be that the long shots did not come on the same days as the long strings of kills. That is the only way in which we can explain the two, unless it is granted that Joe Manton had barrel boring secrets which were not handed down to his successors in trade. This seems to be hardly likely, as Charles Lancaster the elder, at least, was one of his barrel borers, although he seems to have relied more particularly on a man named Hussey.

We have not succeeded in discovering a portrait of

Manton. It is possible that he figures in the picture of Colonel Hawker's shooting party, drawn at the time Manton was staying and shooting with him, but if so it is impossible to identify the gunmaker. Colonel Hawker records the fact that he was presented with a gun valued at 100 gs. by Manton, so that present-day prices, in spite of the complication of modern mechanism, are not high by comparison. But if it is doubtful whether Manton could bore a gun to shoot as well as or better than those of to-day--and it became a lost art after his death if he could—it is not in doubt that he revolutionised the style and handiness of the weapons. His guns now in existence have just about the bend and cast off of fairly well-bent guns as turned out by present-day makers—neither more nor less; but they are very different indeed from the bend of the eighteenth-century gun figured in our chapter on the old Dublin gunmakers John Rigby and Co. We think that Joseph Manton can be fairly credited with most of this change.

Colonel Hawker's account of Joseph Manton in the field of sport is amusing, and although Manton was a good shot he had not the physique necessary to the hustling about of partridges at a quick rate.

We quote from Colonel Hawker's diary :—

" 17th.—Assembled my myrmidons for one more grand field day, in order to have some of their likenesses. Mr. Childe attended as a strict observer, and Mr. Joseph Manton shot with me. Our united bag was forty-eight partridges and one hare, and we returned some time before the day was over in order that Mr. Childe might complete by good daylight the necessary sketches of the group. My share of the bag was 28 partridges, but had I shot entirely by myself, and been able to waive the usual ceremony of shooting in company, and galloped up to all my birds, as heretofore, I am confident I should have killed thirty brace of birds. I therefore calculate that by taking out another sportsman the larder fell six brace short: because to follow birds up, as I ought in this wild country, I must do that which in company would be unsportsmanlike and ungentlemanlike to whoever was my companion: and Joe Manton, not being one of the quickest movers, either on horseback or on foot, doubly retarded several of the necessary attacks.

" 18th.—Stayed at home with Mr. Childe to arrange for the dis-

position of the picture, etc., while a friend and Joe Manton went off shooting. Nothing in 'Hudibras' or 'Quixote' could be more ludicrously crisp than the result of their day. They were to beat us all by going in a quiet way, and meant to astonish us by showing what could be done by one dog and a little poaching on our neighbours. But (yes, but), as the kitchenmaid (and the devil) would have it, the aforesaid dog unhappily fell foul of a tub of butter-milk just before starting, with which he so preposterously blew out his paunch that he was pointing all day, not at birds, but to open both his ports in order to be relieved of the cargo he had taken in; and before he was sufficiently in trim to do anything but make his deposits from one port and cast up his accounts from the other, it was time to come home for dinner, and the *finale* was a deluge of rain. So much for butter-milk. Joe Manton suspected I had played this trick as a punishment for his challenge: but I was as innocent of the hoax as they were of the murder of the game, they having got but seven birds all day."

Manton was in prison for debt in 1829, and he died in 1835 at the age of sixty-nine. From wealth, therefore, he was reduced to want, by the assistance of the lawyers and the patent laws. Colonel Hawker was asked to write an inscription for his stone, and he did not overstate the merits of the man when he wrote as follows:—

"To the memory of Joseph Manton, who died, universally regretted, on the 29th day of June, 1835, aged sixty-nine. This humble tablet is placed here by his afflicted family, merely to mark where are deposited his mortal remains. But one everlasting monument to his unrivalled genius is already established in every quarter of the globe, by his celebrity as the greatest artist in firearms that ever the world produced: as the founder and father of the modern gun trade, and as a most scientific inventor in other departments, not only for the benefit of his friends and the sporting world, but for the good of his King and country."

In making various attempts to get an authentic portrait of Joseph Manton we wrote to his successors in business, Manton and Son, of Calcutta. We append their reply, which gives some interesting details going to confirm our statement that the majority of Manton's guns were of a bend that is common enough to-day.

Here are the descriptions and measurements of some

few that are still in the possession of Manton and Co. of Calcutta :—

1. A flint and percussion double gun, named on locks "Joseph Manton," number on guard 11028. Stub twist 14-bore $29\frac{1}{2}$ in. barrels, with flat top rib. The stock is well bent, $1\frac{3}{8}$ in. at comb and $2\frac{1}{4}$ in. at heel; length $14\frac{1}{2}$ in., and the gun weighs $7\frac{1}{4}$ lbs. The locks have an ingenious arrangement to effect the alteration from flint to percussion or *vice versa*. The flash pans are pivoted, and carry nipples on their rear faces. They can be secured in either of their dual positions by means of small thumbscrews passing through them and engaging on the pivots. By slackening these screws and turning the flash-pan pieces about one-eighth of a circle forward the nipples are brought into position to be struck by the recessed shoulders of the cocks. The touch-holes and vents are gold-lined, and the gun is lightly engraved with a bold scroll ornament. The stock is well figured and of good grain. The barrels of this gun are not named.

2. A double gun by Joseph Manton, No. 1620, originally flint and altered to percussion by new pivoted pieces carrying nipples replacing original hammers, and new cocks. Stub twist 20-bore barrels, $30\frac{3}{8}$ in. in length; named on top rib, "Joseph Manton, Mary-le-Bone, Park House, New Road, London." Bend of stock, $\frac{5}{8}$ in.— $2\frac{1}{4}$ in.; length, $14\frac{3}{8}$ in. The gun weighs $5\frac{3}{4}$ lbs. The butt of stock is thickened towards the toe, and the combs of cocks are very short. The gun handles very well and is in good condition.

3. A double gun, named on top rib, "Joseph Manton, Hanover square, London"; on lock plates, "Joseph Manton's Patent"; number on guard, 9027. This gun was probably begun on as a flint and altered to percussion in course of manufacture. The cocks are flat, with blued steel let in noses. The nipples are set in rare ends of breeches, but the lock plates are cut away as for flint. Stub twist 5-gauge barrels, $29\frac{3}{8}$ in. long; bend of stock, $1\frac{1}{2}$ — $2\frac{1}{4}$ in.; length of stock, $14\frac{3}{4}$ in.; weight of gun, 6 lbs. 11 ozs.: a little scroll engraving on lock plates, etc. A very fine-grained, well-figured stock, and the gun is in very good condition.

4. A pair of bar lock percussion double guns, Nos. 8996-7, named on top rib, "Joseph Manton, Hanover Square, London"; on lock plates, "Joseph Manton Patent." Stub twist barrels, $29\frac{1}{4}$ in. 18-bore; length of stocks, $14\frac{3}{8}$ in.; bend at combs, $1\frac{3}{8}$ in.; bend at heels, 2 in. A little bold scroll engraving on lock plates; a trophy of open book, hammers, battle-axe, etc., on guard and top of break off. Plain pattern cocks with rounded noses. A very neat-looking pair of guns, weight $\frac{1}{2}$ lbs. each. In splendid condition.

5. A pair of flint-lock double pistols, named on lock plate, "Joseph Manton, London," numbered on barrels 2055, stub twist barrels, 9 in. long, 20-gauge, heavy for ball, very finely finished locks with safety tops. The breeches are stamped in gold "Joseph Manton Patent," and ornamented with broad gold inlaid lines. The touch holes are gold-lined. In perfect order.

In sending these particulars the firm add some information that may be interesting, as the last page of Joseph Manton's memoir.

"We regret we have no likeness of the late Joseph Manton, nor of his nephew, Mr. Frederick Manton, who was sent to India by his uncle to start the firm in Calcutta. As far as we are able to ascertain, Mr. Fred. Manton arrived in Calcutta about 1820, and on the death of his uncle all the books connected with the firm of Joseph Manton were sent to India, and up to a few years ago were in our possession, but have been entirely destroyed by white ants. The most valuable book was the stock book, from which we could trace for whom any gun bearing the name of Joseph Manton was originally made, but even this has been destroyed. We now have in our possession the several weapons mentioned in the enclosed list. These (and others) were also sent to India when Mr. Joseph Manton died. We have also a pair of flint pistols, fully described in the list: these were recently presented to our senior partner by an old constituent. All of these weapons must be of considerable value at the present day."

The business of Manton and Co. was purchased by Mr. William Robert Wallis about the year 1847; he worked the business successfully until his retirement from India in 1878, when the same was taken over and is now worked by his sons. The firm has flourished, and has held the appointment of gunmakers to every Viceroy of India, and bears the highest reputation as the pioneer gunmakers in India. In 1850 the old firm of Samuel Nock, of Regent Circus, was purchased by Mr. William Robert Wallis, and the goodwill of that business is also the property of the present proprietors of Manton and Co.

There was one device adopted by Joseph Manton that is not mentioned in any of the guns above described. This was a falling catch which caught a slot in the cocks when the gun was in an upright position. This was done so

that one barrel could be safely loaded while the other stood at full cock. It is needless to say that this arrangement precluded the possibility of overhead shots, as in that position the gun cannot be fired. A Manton weapon with this arrangement is in the possession of Mr. Purdey.

CHAPTER XIX.

PAST MASTERS—JOSEPH LANG.

THE name of Joseph Lang can never be forgotten by those sportsmen who have the smallest acquaintance with the literature of sport. Joseph Lang was one of the first London gunmakers who followed Old Joe Manton in the field, and believed in practice as well as in precept, but it is not because of his sportsmanship nor his gunmaking that sportsmen will remember him, but because he was the foster-parent of the modern breechloader, for the deadly instrument was a French invention, and was only forced into favour by Lang after very much opposition. But Joseph Lang had another claim to memory: it was he who made the lemon-and-white pointer fashionable. Years afterwards Mr. Whitehouse, of Ipsley Court, Redditch, took up the breed, and we expect still has some of them. Possibly it will be necessary to consider Joseph Lang as a game-finder with his pointers before we tackle the business of the gun. We get most of our knowledge of Lang from his own letters, both on the subject of dogs and guns. It is necessary to find your game before you can kill it; therefore, we will consider Lang's celebrated letter to General Hutchinson, on the pet subject of both of them, before we proceed to the subject of guns. He begins —

“ 7, Haymarket, January, 1850.

“ Sir,—On perusing your book on dog-breaking, I really find little, if anything, to say that will assist you in your new edition; but I must observe that I think you would be doing a service to the community if you would lend a helping hand to improve the breed of pointers: or rather to get up a sort of committee of sportsmen (thorough judges) to investigate into the pedigree of dogs, and express their opinion of the make, nose, durability, etc., of the several animals

admitted to them: that prizes might be awarded, or stakes hunted for: and books kept of the pedigree of the several competitors, much in the same way as such matters are managed with greyhounds."

That we, who have taken part in so many "stakes hunted for," should be engaged in reviewing Lang's then prophetic proposal is perhaps as it should be. It may be remarked that Lang's idea of combining a judgment of appearance with a trial of field qualities was accomplished in the first field trial, held in the sixties in Bedfordshire, in association with a dog show at the Agricultural Hall. It has for many years been our opinion that if this system had been persisted in no distinct classes of show animals would ever first have beguiled unwary shooters, and afterwards disgusted them. We do not affirm that driving would never have come in, because that would be clearly absurd, and would argue a want of knowledge of the habits of game and requirements of shooters: but we do say that but for the show dog, as distinct from the working and field-trial dog, there would have been much less monotonous walking in line, and many unsuitable moors and manors would not now have been given over to bad driving. There never was a dog-show pointer or setter who could not claim a distant connection with some field-trialer, an unfortunate fact that enabled unscrupulous sellers to get all off "as field-trial blood," to the degradation of all. We never met the sportsman who had not had his experiences of "field-trial dogs," and generally they were most unfavourable. It was of no use investigating. "Once caught twice shy" applied in most cases, and driving was the almost unfailing outcome of an experience of "field-trial dogs" direct from the showman's travelling baskets. Lang's letter continues—

"It is of no consequence how fast a dog travels who is wanted for the moors, or how wide he ranges: but such a dog would be worse than useless in the south, and in all small enclosures. I feel assured that dogs which are first-rate on grouse are not fitted for partridge. My experience tells me that not one dog in twenty is worth keeping—that the generality do far more harm than good—this I see almost every day that I am out. There seem to be nowadays no recognised thoroughbred pointers but those obtained from one or two kennels

in Yorkshire. I have shot over many north-country dogs, but found there was too much of the foxhound blood in them for the south—they are too high-couraged, and range much too far. After the first fortnight of partridge shooting you want quiet, close rangers, who will never move until told. In the turnip-fields in Norfolk you will get among lots of birds, and you may then fill your bag any day, provided you can hunt the field in perfect quiet; but with a rattling, blustering dog you will hardly get a shot, yet you want a dog that shall be neither too large nor too heavy."

This is all very interesting, it represents the majority of opinions. It represented Joe Manton's opinion in opposition to Colonel Peter Hawker's. Lang thought that Colonel Hutchinson was wrong in saying that dog-breaking did not require much experience. We are inclined to think that he was right as applied to his own methods, that he, at any rate, had not had experience enough to find out that a dog can be broken to range fast and wide or close and slow as circumstances require. Yet this is a fact beyond question. Many a time we have done it ourselves, often with dogs that, when they reached the field trials in spring, covered much more space with their legs than the judges believed it possible had been tried with their noses. Yet such was not the case. It is easy to break dogs to range to order, but when that has been learnt, when once the dog has become aware that he is to go where you want him to, that when ordered he is to beat that bit of bad-looking, parched-up, and covertless ground, in preference to the nice lying, off which a scent is blowing from the far-off corner of the field: when he has learnt this, he has also learnt, for a certainty, that he is not to leave game behind him for the sake of getting quickly to better covert. Then it is that it becomes wisdom to trust him implicitly, and when interference with his range should not be lightly indulged by field-trial judges, young shooters, or Scotch keepers, whose estimate of a dog's capacity may be ninety per cent. below the form they see before them for the first time, and cannot understand. In opposition to Lang, we would say that no dog ever went too fast, anywhere, that neither missed game nor flushed it. It is true that high-couraged dogs require an education in turnips, long

or short as the case may be. We have taught the highest-couraged ones to creep in them, with silent feet and still stern, but the finest, most killing work we ever saw done in turnip fields has not been done by creeping. Still, in one respect Joseph Lang was partially right. There are some fast dogs that cannot be silent in turnips whatever their education. But we should not necessarily call these grouse dogs.

It is no dictum of ours, but was written before Hawker, Joe Manton, or Lang, that the setter's foot should be silent. We may add that his breathing should be silent also. In our view a blundering, rushing dog in turnips is a blundering dog anywhere. That turnips are the most severe of all tests for a pointer, or setter, or retriever is certain: but the dogs that can do them fast, quickly (not synonymous terms) and silently, are fit for any moors on which driving, for many generations, has left the grouse confiding enough to stop in the same parish with either dog or shooter. Lang found that his close rangers, with which he did good work in Yorkshire, were no use in the fields. So that, even on his showing, close ranging does not always charm the birds into close-lying.

"Not one dog in fifty of the many I see properly hunts his ground. The reason is this. The keepers in the north—yet none understand their duties better—take out a lot of dogs along with an old one; off they all start like oiled lightning—some one way, the others just the contrary: one gets a point, they all drop and stop. The keepers say, 'Is not that beautiful?'—is it not a picture for Landseer?' I have followed the party on the moors over the selfsame ground a dozen times, and obtained with my brace of close rangers and good finders double the number of shots that they did, and three times the amount of game: for I was walking at my ease, and giving my dogs time to make out the birds—which is very essential in the middle of the day when there is a scorching sun.

"I recollect one instance in particular. Some years ago I had just arrived at the top of a very stiff hill on the Bradford Moors (in Yorkshire), and was making for a certain spring where I had forwarded my luncheon, and a fresh supply of ammunition, when I saw, immediately before me, two gentlemen with their keepers, and four very good looking setters, hunting the precise ground I had to take to get to my point—about a mile off. I therefore sat down for a quarter of

an hour to let them get well ahead. They found several straggling birds; but there was such a noise from the keepers rating and hallooing to the dogs that, although they got five or six shots, they only bagged one brace of birds. When they reached the spring, they observed me coming over the very ground they had beat a quarter of an hour before. I got ten shots, every one to points, and killed nine birds. I was highly complimented on the beautiful, quiet style of my dogs, etc., and was offered a goblet of as fine old sherry as man ever drank. I need not observe that I much relished it after my morning's walk. The gentlemen said that if I felt disposed to take the dogs to the Tontine Inn, Sheffield, when I had done with them, I should find fifty guineas there awaiting me; but I declined the offer, as on several occasions I had repented having yielded to the temptation of a long price for favourite dogs. The brace I refused to sell were young setters, bred by Tom Cruddas, keeper to — Bowes, Esq., near Barnard Castle, Durham. I subsequently found them very unfitted for the style of work required in small fields and indifferent stubble, and I was well beaten in a trial with them against a brace of Russian setters. I afterwards procured the latter by exchanging my Englishmen for them. For two years I was much pleased with the foreigners, and bred some puppies from them; they did not, however, turn out to my satisfaction. I then tried a cross with some of the best dogs I could get in England and from Russia, but could never obtain any so good as the original stock. I have now got into a breed of red-and-white pointers from the splendid stock of the late Sir Harry Goodrich, and many another hundred head of game should I have killed—and in much greater comfort and temper should I have shot—had I possessed so perfect a breed twenty years ago."

In the last paragraph the allusion is to the lemon-and-white pointers. These it is evident that Lang thought had not got too much of that foxhound blood that he condemned. He has a modern imitator, for Mr. W. Arkwright, of Sutton Scarsdale, still believes there is too much foxhound in the average pointer, but he would probably not go so far as Lang in wishing to tame the range of the pointer as well as to eliminate the foxhound blood. The writer of this letter continues thus:—

"As a proof of what can be done with dogs, I will mention that I broke in a spaniel to hunt (with my setters) in the open as well as in cover, and made him 'point,' 'back,' and 'drop to charge,' as perfectly as any dog you ever saw; and he would, when ordered, retrieve his game; the setter, meanwhile, never moving until desired. I shot over

them for years. They were a very killing pair, but had not a sporting look. In September, '38, I took them with me to an excellent sportsman, Sir Richard Sutton. The old Squire Osbaldiston was there. They were both much pleased with the dogs. By letting my poor pet 'Dash' run about, he was bitten by a mad dog in the neighbourhood. Of course I lost him.

"Speaking of spaniels, I must say I think that there is no kind of dogs that retrieves birds so well in thick turnips, where so much dead and wounded game is frequently left unbagged. With 'Dash' I seldom lost a feather in the strongest turnips in the course of a whole day: but I now rarely go out with sportsmen but that I see two or three birds lost—sometimes more—from what are *said* to be the best breed of retrievers in the country. The constant loss of wounded birds is one of the drawbacks to the Norfolk shooting, where, without doubt, the finest shooting in England is to be obtained. Gentlemen there go out, some four, five, or six in a line, with only one or two retrievers, and a man to each to pick up the killed game. The sportsmen never stop to load, for each has generally a man by his side with a spare gun ready charged. If a bird is winged, or a hare wounded, the dogs go in at once to fetch it. Were the sportsmen to divide into distinct parties, each party taking one or two steady, close-ranging dogs, what much more true sport and pleasure they would have!—and kill, too, quite as much game."

What a change has come over the county since these lines were written. The walking up in Norfolk has given place to driving; the pointer and setter in less-favoured districts has given place to walking in long line, and the spaniel is a fashionable retriever, and a sporting-looking one, too, in our opinion, *i.e.*, when he brings in two birds for every one the aristocratic, satin-coated dog-show retriever brings to hand. The late Sir F. Milbank was a believer in spaniels, as retrievers, for driven grouse.

As a retriever the spaniel is at home in the drive, but is hardly in place either on a grouse moor, in the ordinary sense, or in cover. In the former case your pointers and setters will possibly retrieve, and in the latter the spaniel is too excitable to be as trustworthy as, say, the retrievers bred in, and particular to, the county; and there generally are such capable of taking the shine out of all the dog-show aspirants.

"You ask me wherein I differ from you in what you have written? Certainly in very little—and I have sent several gentlemen to Murray's

for copies of your book : but in page 3 you say that ' dog-breaking does not require much experience.' There I cannot agree with you—for how is it that there are so few who understand it? Not one keeper or gentleman in a thousand, in my opinion. The reason is that they have not sufficient practice and experience."

To this remark about long experience Colonel Hutchinson added this footnote :—" The reason, in my opinion, is that they have not been properly taught—how to teach." We agree with that. The first dog we ever broke taught himself, and very well too. The next, not being quite of such an accommodating disposition—the two not being as like as two peas in a pod—we broke and spoiled. After this we discovered that it was very easy to teach a dog what he ought to learn, but that it was quite as easy to teach him what he ought not to know, and that, having accomplished the latter to the perfect satisfaction of the pupil, it became a fearful job to unteach again, and prepare the, no longer virgin, soil for future cultivation. The principle that we adopted with great success in later years, whether we were breaking retriever, setter, or any other dog, was this: Never let your dog do wrong. It sounds very simple, and it is as simple in practice as in language; but then, as Colonel Hutchinson remarks, you have to be taught—how to teach. and experience is an everlasting schoolmaster, so that it is better to go to another. We were greatly assisted by Colonel Hutchinson ourselves, but not until experience as a schoolmaster had become rather a nuisance. Lang continues :—

" In another point I differ from you. I have seen some of the best rangers I ever shot over made by being allowed to follow their mother into the field, or some very old dog—what some people would term a worn-out potterer. But I think it a yet better plan to attach a lay cord of about forty yards in length to the collar of the young dog, and let a man or boy hold the other end. You will give a slight whistle when he gets to the extremity of his range, and a wave of the hand to turn him forward or back. By such means I have seen dogs, with a few days' constant shooting, made perfect in that—the most essential thing in all dog-breaking."

Here is a difference of opinion about the best method of entering a pointer and setter, in which neither is altogether

right or wrong. Colonel Hutchinson does not approve of the old dog for a coach, and Lang, with his leaning to a close ranger, does. The fault of dogs so entered is that they will be inclined to follow, and not to hunt independently. This is a most material consideration, but so much depends on the individuals. It is impossible to make some dogs follow, whereas a little diffidence is, in these, possibly an advantage. The general rule is that if the young one has more capacity—more nose and pace—than the old one, no sort of coaching will damage his independence; whereas if he learns to trust to his mother's nose, and he will do so if he has a worse, he will never find out how to use the little nose he does possess. Joseph Lang continues to lecture the Colonel:—

“I observe you condemn the check-collar *in toto*. I think you are wrong. I have seen dogs cured by it who would not drop to shot, but would perpetually rush in, especially if a wounded bird was fluttering near them, and who have been most unmercifully licked, to no useful purpose. I recollect orders being given to destroy a dog that had appeared utterly incorrigible. As he was a beautiful ‘finder,’ I begged that he might be allowed one more trial. I sent to town for a check-collar, and in a few hours he was pulled head over heels half-a-dozen times. He then found out what he was punished for, squatted down accordingly, and never afterwards attempted to rush forward, unless he was over-fresh. You speak of hares not annoying your dogs in Scotland. I have been sadly annoyed by them when grouse-shooting there. In one part, from hares jumping up every five minutes, I had great difficulty in restraining my dogs from chasing; and on this occasion I found the check-collar quite a blessing—for had I used the whip I should have been thrown off my shooting, and the noise would have disturbed the birds. I had at the time two of the best shots in England shooting against me, and I should certainly have been beaten had I not been so prudent as to take out the collar.”

We would neither condemn the mild nor the severe spike collar, and agree, therefore, with Lang. There are exceptions to every rule, and to this one, where the severe treatment saves a world of trouble, and torture to the dog also.

If we read between the lines we see that Lang's dogs were not over well broken after all, for if they would chase hares they had not learnt the A B C of the work. The only difficulty we ever knew with Scotch hares was that

some dogs would hunt the line of them, not as in chasing but as looking for the body scent in the hope of obtaining a point. This is annoying, no doubt, in consequence of the loss of time entailed, but it is overcome when it is experienced by the simple expedient of turning down hill or down wind. In the former case the hares run back after a short circle round, and in the latter the scent is not to be had from the direction in which you are beating, and it is permissible to call off a dog that appears to have scent on ground that he has already made good and passed by. Lang then quotes an experience to show that without vice dogs may go wrong in strange hands, and it is one every experienced sportsman can match.

"I remember selling to a young officer a brace of my puppies, or rather young dogs (for they were eighteen months old), for twenty-five guineas. They were well broken, but had not been shot over. He had not been an hour on the moor before up started one of the small Scotch sheep. Both the dogs gave chase, and on their return the keeper was directed to give them a good dressing. One of them would not hunt for them again, and became so timid that the officer desired the keeper to get rid of it. It was given to a gentleman in the neighbourhood, who knew he could not be far away in accepting it, as it had been bred and sold by me. He took it out a few times, and soon found out its value. The other dog the officer sold for £10, and then wrote a very angry letter to me, complaining of my having sold him such a brace as well-broken. A fortnight after this he invited the gentleman who had become possessor of the shy puppy to come and shoot with him. The gentleman made his appearance with, what he termed, his 'shy friend.' After many protestations against taking out such a brute, it was agreed that it should be done on the gentleman's offering to bet £5 that his 'shy friend' would get more points than either the dogs they proposed hunting; and another £5 that he should prove himself the best broken of the dogs, and never during the whole day offer to chase hare or sheep. The bets were not made, but to show you the esteem in which his late master afterwards held the animal, he offered fifty guineas to get her back, but the money was refused. His brother also turned out a magnificent dog—so much for want of patience."

After this Lang has something to say in the vein of every old-time sportsman, each of whom possessed the best dog in England, as is well known to everybody. It is a

fond belief that we can forgive Lang, for we have known it to exist even after the test of competition, and, stranger still, after defeat too.

"It is just possible that all I have written may be of no use—but should you find it of any, it is quite at your service. Since I last saw you I have had many more opportunities of observing the extraordinary nose of the dog I showed you—a quality in which I fancy forty-nine out of fifty dogs are deficient. I sent him down to Hickfield Place, Hants, for the Speaker, who is an excellent sportsman, to use for a few times to see if he was not superior to his dogs. He returned the dog with a very handsome basket of game, saying he was one of the finest dogs he had ever seen hunted, and he begged me to get him a brace of the same kind against next season, stating that the price would be no consideration if they proved as good as mine. I have tried him against many other old dogs, *said* to be 'the best in England,' but not one of them had a shadow of chance against him. I have refused a very long price for him. For beauty, style, symmetry, nose, durability, and good temper (a great thing), none can beat him. I should like to increase his breed for the sake of the shooting community: yet I have no wish to keep him publicly as a sire, nor to send him away. I think I should be doing a general benefit if I gave it out that his services could be obtained for three guineas, and that the sums thus obtained were to be set aside as a prize for the best dog, to be contended for by competitors who should give £3 or £5 each. Something of this kind could, I think, be managed, and it would greatly tend to improve our breed of pointers. I bought a bitch with the view of getting some pups by him. She had nine, but not one like the father, grandfather, or great-grandfather—so I sold her, puppies and all. I have just purchased another; she comes of an excellent stock, and has good shape. I shall see what luck I have with her. She is a far more likely dam.

"I should have written to you long ago, had I not expected to meet the person I term my Yorkshire breeder. He is *the best breaker I ever saw*, and a man you can depend upon. He and his father, for sixty years, have borne as high a character for honesty as for excellence in breaking. Many a time has he contended, and always come off victor, against Mr. Edge's dogs—a good trial kennel, but the breed have savage dispositions, bad tempers, and are very unmanageable when young. I have tried many of them myself, and have no faith in them."

It is curious to observe that the very breed of pointers Lang praises so highly in this letter were all descended from

Edge's blood. Mr. Whitehouse's celebrated lemon-and-white dog Hamlet was descended from this liver-and-white kennel through Lang's lemon-and-white strain.

"On the moors, when the work is excessively fatiguing, and plenty of water is generally to be found, you may with advantage employ setters: but in a hot September, in England, when no water could be procured, I have known some of the best setters I ever saw do nothing but put up the birds. In midday, when there was but little scent, their nasal organs seemed quite to fail them, and, being fast, they constantly ran into coveys before they could stop themselves.

"I was once asked to be umpire in a match between a pointer and a setter. It was to be decided by which of the dogs got most points in the day. As this was the agreement, I was obliged to abide by it and decide accordingly: but that is not the test by which the superiority of dogs ought to be determined. I presume what is really wanted in a dog is *usefulness to his master in killing game*. If so, that dog ought to be considered best which gets his master most shots within a rise not exceeding forty yards. The setter being faster, and taking a much wider range, got by far the most points, therefore I was compelled to award him the prize; but the pointer made twenty-two points, to which the party got twenty-one shots. The setter got thirty points, but only sixteen of them could be shot to, and he put up thrice as many birds as the pointer. I could mention twenty other similar instances of trials between pointers and setters, but I should fill half a dozen more sheets, and not interest you. It is getting dark, so I will conclude my long yarn."

We have little to say about the difference, constitutional or educational, between pointers and setters. Lang's remarks do not apply to the present state of shooting, and the differences do not exist between high-bred dogs of the two breeds. That there are pointers that can stand cold equally to the fine-coated modern setters there is no doubt. Moreover, even if it were not so, we use neither the one nor the other in the depth of winter, so that this difference does not count. Then we do not believe the modern setter requires more water than the pointer, and we know that he can find game at all periods of the day. There are good and bad of both breeds, the latter vastly in the majority, and the greatest variation of all exists, not between the slug and the high ranger, but between the various olfactory powers of

the animals. It would be an extraordinary difference were one animal to travel only six miles an hour and another thirty miles an hour, the one being five times as fast as the other. We do not think such differences exist, yet it is no uncommon thing to see one dog find birds at 100 yards, and another, of exactly the same breed, not only unable to smell them at twenty yards (one-fifth of the distance), but unable to smell them at all. Many a time, as even field trial reports show, the dog that should have backed goes in and tumbles over the birds to his own surprise. Yet we do not expect the greatest differences that do exist—that is, both extremes—to be found at field trials, for it is usually supposed that the picks of each kennel are to be seen there.

We are not sure that Lang's test of usefulness will hold water judged by the light of his condemnation of walking up the game in line. Taken literally, Lang's words presuppose that a man cannot take dogs out when they are best left at home, which is nonsense. If the dog is only wanted to point birds within shot, and never to range more than forty yards from his master, a spaniel will do the work, and the setter's, as well as the pointer's, business is gone. In the case instanced of a bad setter (bad because he flushed numbers of birds), the pointer may have been the better dog, but eliminate the flushing, and it might be said that what the pointer found would probably have been flushed by the guns, and what the setter found required hunting for. It is a test that would be very excellent if it could be properly applied. It only has one fault. It does not act well in practice. For instance, the best pointer or setter under such circumstances of trial would be a good retriever who was taught to point from his position at heel. Such an one we have had, but we never relied upon him to find the game. It is a test that could only fairly apply between two dogs having similar range and equal pace.

It is extraordinary but true that it never seemed to strike either of these celebrated dog-breakers that high ranging dogs could be taught to range close and carefully by order, and that it is infinitely preferable to have dogs that can do the moors or the turnips equally well.

But, after all, Lang's comparative remarks were somewhat elementary. He does not even tell us what breed of setters he alludes to. To-day the differences in the three breeds of setters are far greater than those that exist between the modern high-bred pointer and English setter. The Irish setter has "come on" wonderfully of late years, and he is now a creditable opponent at field trials. There always have been isolated instances of first-rate Irish setters, but the majority of them are headstrong dogs, with poor nose and low carriage. A really good one is as valuable as he was, until lately, exceptional. On the other hand, the so-called Gordon, *i.e.*, the black-and-tan dog show animal, is a slug, as self-willed as the Irish, without their redeeming virtues of grace, courage, and action. The Gordon setter originally was as often red-and-white as black-white-and-tan; he was never black-and-tan, until after the death of the last Duke of Gordon, yet a variety that bears his name has been evolved out of dog shows by the assistance of the bloodhound and the collie and the Irish setter.

We have an easier task when we have to deal with Lang as the pioneer of the breech-loader. Many of his theories were wrong. His view that the recoil was less, for instance, shared by that excellent sportsman, "An Old Sherkarry," and also their view that the breech-loader shot harder, were both afterwards found to be wrong. But their views were also challenged on the score of safety and cleanliness, and time has shown that there was no more comparison in this respect than there is between the simplicity of loading a modern ejector and an old muzzle-loader. But the correspondence that raged at that time has some points of great interest, and we therefore quote three letters of the date of 1857 to show what was the general opinion, and also what were the difficulties and prejudices that had to be overcome by Lang. In one of these letters it will be observed that what is now called the *Field* loading, *i.e.*, a tight wad between powder and shot, was used many years before that paper discovered it, and in fact, came in with the breech-loader introduced by Lang.

The following is a letter written by Lang in 1857 in defence of the breech-loader :—

“ Sir,—Having seen my name figuring rather prominently in your journal, I must beg you will be good enough to show the public both sides of the picture, and I am content to bow to their decision; but I really cannot allow such unfounded statements as those made by your correspondent C. F. W. to pass unnoticed.

“ On referring to his letter now before me, he commences by stating that the advantages of the breech-loading gun and rifle are certainly in many instances very great. So far so good: but then he goes on to make a series of assertions which he cannot prove, and which I maintain are not correct, and which, if left unnoticed, might mislead the public. He states they ‘do not shoot so strongly as the ordinary gun,’ as they are not sound at the breech. I say, Try them: I court the most rigid scrutiny and only require an impartial judgment. With regard to the latter part of his statement, I may mention that every breech-loader that now leaves my establishment has the Tower proof-mark both on the barrels and on the action—a certain proof that the breech is sound, and has been severely tried. The barrels (13-bore) are first proved with 15 drachms of powder; after they are fitted to the action, detonated, and finished ready to send out, they are proved again with eight drachms of powder (both barrel and breech), and are stamped a second time at the Proof-house: I have never had one burst in the four years I have made them. But I wish to convict C. F. W. by his own evidence on this point; for, after stating that the breech-loader is not sound at the breech, he goes on to say that, ‘Were I to go out by myself, and of course carry my own ammunition, I should use a breech-loader’ (*vide* his letter). What a poor value C. F. W. must put upon his own person, if he would use a gun he knows is not sound at the breech, and which must be consequently dangerous.

“ I shall now proceed to his second assertion, which I hold to be as equally unfounded as the first, as many of my customers can prove that they seldom have more than one or two miss-fires in a box of 500 cartridges. I used 400 cartridges in Norfolk the first five days of the season this year, and never had one miss-fire the whole time, although it rained considerably for two days of the time: this can be proved by the gentleman I was out with. With respect to his statement about the size of cartridges, I beg to say with mine there is no difficulty now: when I began with them some years since it was the case. It is true the cartridges for the breech-loader cost a trifle more than the charge for the ordinary gun (about sixpence per dozen): but then this is almost counterbalanced, as neither shot-bags, powder-flasks, nor loading-rods are required: the outlay and wear and tear of the articles almost make up for this slight difference. With regard to his fifth

assertion, that they are no protection against the weather, any unprejudiced person would contradict this statement by a single glance at a gun on the breech-loading system, where the cap is exploded in the centre of the cartridge. With regard to clean fingers and gloved hands, which C. F. W. says he considers hardly worth noticing, I conclude from his own argument that he is unaccustomed either to one or the other. I must again convict C. F. W. on his own evidence, just to show how utterly valueless is the whole of his doctrine. He says, 'With regard to the breech-loading rifle there can be no question, nothing can compare with it for military purposes, more particularly when used on horseback.' So far so good; but then he damns this opinion by going on to say, 'For sporting purposes, however, they are useless; for that upon his honour he never saw a rifle shoot worse.' And he even offers to back any ordinary thirty-shilling smooth-bore gun against it two to one at 100 yards. (I think I know the rifle C. F. W. alludes to; if so, a wrong mould was sent with it.) I am willing to accept that for fifty pounds; and should he not think that sufficient, I can get him five hundred on it. What am I to judge from the two conflicting opinions, but that he considers that an inferior kind of rifle, which he deems unfit to place in the hands of a sportsman (perhaps on the unsoundness of the breech), is sufficiently good to place in the hands of a soldier, in whose efficacy is often placed the safety and honour of old England. For the honour of my trade I hope this opinion will not find a seconder in it. With regard to his insinuations against my guns and rifles, it is not for myself to boast; but if hundreds of testimonials from some of the first sporting men in England are to be considered of any value, I can show them. Besides which, I may mention that my shooting-ground is always open to public inspection, and all I require is that sportsmen will see and judge for themselves instead of trusting the report of interested individuals. I may mention that this day, at Hornsey Wood, one of my double breech-loading rifles was tried by a gentleman, a well-known sportsman, who, at the distance of one hundred yards, put thirteen balls out of eighteen into a three-inch bullseye, and four of the other shots were placed within two inches of the outside ring of the bullseye, and that, too, with a conical ball, which C. F. W. says will not answer with a breech-loading rifle. This can be verified by several witnesses. Let this fact speak for itself; give me an impartial trial, and I ask no more.

"JOSEPH LANG.

"22, Cockspur Street, London, Nov. 18th."

"Sir,—I observed a letter from the pen of a writer who styles himself 'The Inventor of Minié and Enfield Rifles' (though I much question his right to claim an invention bearing the name of a French

officer). The ignorance of your correspondent is so very palpable, that it suffices to instance one example only as being sufficient to damn his theory. I quote his own words: 'If the breech-loader recoils less, *ergo* it shoots weaker.' What a preposterous principle for a gunmaker to advocate, for by it he would lead us to infer that if a gun does not recoil it shoots weak: if it kicks it shoots strong. Should he make his guns according to his principles, I can only say I pity his customers.

"Despite of my alleged ignorance 'of scientific gunnery as established at the present day' (which subject is most emphatically dwelt upon by your correspondent), I affirm that recoil generally proceeds from want of weight of metal at the breech. One reason of accounting for here being less recoil from a breech-loader than a common gun is, that there is considerably more weight of metal at the breech. Another is, that at the bottom of the cartridge of the breech-loader is a tight roll of paper of the thickness of one-sixth of an inch, which (like the buffer of a railway carriage) gives with the action of the powder, and lessens the recoil. Thus can a greater charge of powder be used, and consequently the shot is driven further and harder.'

"My reason for accounting for the fact that the report of a breech-loader is less than that of a common gun loaded with the same charge is, that the whole of the explosion takes place internally. In the common gun the noise of the cap and the powder of the nipple takes place externally, consequently the explosion is louder than when the explosion takes place in the interior of the barrel.

"With regard to the rest of your correspondent's letter, I do not think his unsubstantiated contradictions and his sweeping assertions have in any one instance disproved any of the advantages which I maintain the breech-loader possesses over all guns that load at the muzzle.

"H. A. L. (AN OLD SHERKARRY)."

Thus Lang had one of the most experienced sportsmen of the time to assist him. Nevertheless, we do not think that science would back up all the theories of "An Old Sherkarry." The following letter is interesting as showing what opposition the best inventions always encounter:—

"Sir,—Neither Mr. Lang nor 'A Soldier' have ventured to refute the principle I have advanced, but (for their case unfortunately) find fault with my want of knowledge of the 'improved principle of breech-loader,' and in doing so, have exposed a weak point in their defences. Mr. Lang, in his description of the principles of his own gun, says that, in the breech-loader, as manufactured by me, the inside of the cartridge is larger than the tube of the barrel: and I use wadding a

size larger than the tubes of the barrel, which, being driven through, accounts for the gun shooting so strong.' I regret that Mr. Lang has not been a little more explicit, and told us exactly how much larger the barrel is bored out to admit the pasteboard of the cartridge—the length of the cartridge as described by 'A Soldier'—for this is a most essential point, and I would rather have no conjecture in the matter. I suppose, then, the thickness of the two sides of pasteboard is equal to two sizes of bore, the interior of the cartridge being another size larger than the bore of the barrel. It follows as a certainty, then, that this cavity at the ends of the barrels is three sizes larger than the bore—if a 13-bore the cavity is at least 10; and in this cavity of 10-bore the explosion is generated. Will there be any doubt in the mind of any reasoning individual that this explosion must create a great recoil? The friction of the projectiles passing out of a larger into the tube of less diameter must be very great; and if so, there must be a proportionate useless expenditure of force—an expenditure amounting to a large percentage of the whole force. Now the true principle of gunnery is 'the greatest result with the least means. Suppose a trial between two barrels equally alike in everything—area of inner and outer surface (with the exception of 'this important cavity'), charge of gunpowder of the exact number of grains, wadding, shot, equally balanced by a gold scale—can the breech-loader (which, it will scarcely be denied, offers friction of twenty to twenty-five per cent. by this cavity) shoot equally strong as a muzzle-loader? If so, power is enhanced by retarding its velocity; whereas the scientific view of the matter is, that the less friction the easier the attainment of high velocity; and it has been held that high velocity is strength of shooting. Mr. Lang says 'the cavity or increased size of wadding is the cause of the gun shooting so strong.' Can any sportsman be found foolish enough to try the experiment of enlarging the breech end of his gun, even one size? Would he be likely to fire two shots—if hardy enough to fire one? Thus falls to the ground the boasted strength of shooting equally strong. Where all things are equal, it is an impossibility; where more gunpowder is in question, it becomes another thing. It will doubtless be said that the pasteboard of the cartridge fills this cavity, and that in reality no enlarged space exists. There are few that estimate the many pounds pressure upon the inch of surface in the breech end of the gun at the instant of explosion but will be fully aware of the compression that must take place in that pasteboard, compressed at least into half its original thickness, and thus, at any event, leaving cavity more than sufficient to establish my premises—if it were not already acceded by the necessity of force to extract the cartridge from the barrel.

"I will now refer to a subject of greater importance—safety.

Breech-loaders are not equally safe with a muzzle-loader of the same dimensions; nor will they stand anything like equal proof. Mr. Lang states that the barrels 13-bore are first proved with 15 drachms of gunpowder [how? having no screwed breech], and when ready to send out they are proved again (both barrel and breech) with 8 drachms of gunpowder.' Is this after the cavity is made? On reference to the Gun-barrel Proof Act, I find the following:—'Fifth class, comprising revolving and small arms of every description and system:' and at the foot of the columns for scale of proof, I find the following note, viz., 'Revolving arms, etc., of the fifth class shall be proved once only, and such proof shall be by the scale laid down for definite proof for the fourth class.' Fourth class 'definite proof, 13-bore, $7\frac{1}{2}$ drachms.' The above needs no comment, but shows the estimate the framers of the Act of Parliament held of the resisting powers of breech-loading arms.

"I have no intention to accept Mr. Lang's offer of a bet, nor will I shrink from the combat like 'A Lincolnshire Gunmaker'; but I will offer the following proposition to the consideration of those advocates of the breech-loader who are anxious to have demonstrative proofs of the inferiority of their favourite arms:—If three or more sportsmen, possessing breech-loaders, will furnish me with the exact measurement, weight, and many other points required by a manufacturer, I will have made counterparts in every respect, loading at the muzzle; and a trial on the most approved scientific principles shall be gone into with each gun and its opponent. The first point of importance is 'safety': and each shall undergo an equal proof, the lowest starting point of which shall be $7\frac{1}{2}$ drachms, the extreme 12 drachms—leaving still a margin of 3 drachms. The next is to test the 'shooting properties': and in order to do this well, it should be done mathematically true (for it will thus become a point from which others may start in future time): it will therefore be requisite that the gunpowder, shot, and wadding be accurately weighed, the amount of force of recoil correctly ascertained, and the penetration of the projectiles at 20, 30, 40, and even 60 yards, truly and properly defined. The guns possessing the favourite points in the greatest degree shall be declared entitled to receive as forfeit the unsuccessful opponent.

"If a competitive experiment of this nature can be organised I am ready for the 'mêlée,' and in no spirit of rivalry, but a just wish to see 'right' established.

"INVENTOR OF THE MINIE AND ENFIELD RIFLES."

One of these correspondents—William Greener, we believe, father of the present W. W. Greener—laid it down

in the controversy that the greater the obstruction in the barrel (referring to the cone of the chamber) the more the loss of penetration. Could anybody have foreshadowed Mr. Greener's sponsorship of the choke-bore when that was written, or what strange reversals of principle fortune may bring with it ?

CHAPTER XX.

MR. HENRY ATKIN, OF JERMYN STREET.

THERE are several men in London to-day who, like the great makers of old, have worked themselves from their employers' bench to be the trusted advisers of a large circle of sportsmen. They have followed in this the methods by which the most renowned names have been made in the past. Thus the various workmen of old Joe Manton were in the next generation the most consummate judges, as well as the greatest salesmen of London guns. Charles Lancaster, Thomas Boss, James Purdey, and William Moor between them created an epoch in gunmaking. The basis of their success was their own ability in doing the work that they afterwards employed others to do. Now this is exactly what is happening to-day. So much in gunmaking depends upon the man. There is so much of such a varied character to do that it is almost a wonder that men who have been apprenticed to the trade should succeed. We say this because the trade of gunmaking is divided up into departments, and it follows that the best workers in any one of them knows little, or nothing at all, of the others from a practical point of view. We mean by this that a man who has become great as a stocker would not necessarily know anything about barrel-boring, anything about actioning, anything about lock-making, nor anything about shooting. Yet it is, oddly enough, just such men in this generation, as in the last, who are making a reputation for themselves. Thus James Purdey, the founder of the firm, was a stocker for Joe Manton, whereas Charles Lancaster, father of the late Charles Lancaster, was a barrel-borer. Now, of the great gunmakers of to-day, who have carved out their own way in the world, we have spoken of several in former pages, but

one whom we have not yet mentioned is Henry Atkin, a man who served his apprenticeship under his father at Mr. Purdey's. Mr. Atkin is a storehouse of gunmaking lore. He tells us that his father was the first workman employed by the elder Purdey. Henry Atkin, senior, stopped with Mr. Purdey for fifty years, and about 1866 his son left to go to Moore and Grey, where he was for twelve years. In 1878 he opened a small shop in Oxenden Street, and he moved to No. 2, Jermyn Street in 1890.

A talk with Mr. Atkin soon reveals the fact that he understands guns, and that he can perceive little excellences in the work of others, although minute enough to escape the observation of most shooters and many gunmakers. What particularly strikes us about him, as well as about some others of the best men in the trade, is, that they can afford to do full justice to a neighbour. Thus, in discussing work, one rival gunmaker is a splendid mechanic; another, although nominally provincial, does as fine work as anybody; and a third can file a rifle sight like no man in the world besides. There is no running down other gunmakers here, and as we examine guns and listen we become more and more convinced that Mr. Henry Atkin does not know what the green-eyed monster is, and has such a grasp of his subject that he never needs to fear him.

Of late Atkin's guns have made good records at the Gun Club and Hurlingham, and it will be noticed that Ballistite powder is nearly always used in them at those places. We think that gunpowder makers are rather too sanguine when they believe that the powders used by most winners at Hurlingham and the Gun Club are used in sheer imitation by sportsmen. This is so far from being the case that although, in this instance, Ballistite seems to have the public recommendation of this gunmaker, yet, as a matter of fact, he regulates all his guns with another powder. Mr. Atkin holds the almost unique position of having no single-trigger patent action of his own, and he uses Robertson's patent when his customers demand the single trigger. £120 is his price for a pair of guns, and when a man has got a pair he may be sure he has got excellent work, with balance, style

or proportion, and finish or neatness of workmanship. Mr. Atkin's guns do not look as if they would shake to pieces, and as he turns over the pages of his book for us in answer to our query, "What sort of patterns do your customers most demand?" showing us the records of the trials of the finished guns for a few years past (which, by the way, go to prove that a modified choke bore in the left and a cylinder right is about the average demand)—as he turns these pages we observe that the class of shooters he has for customers would never be satisfied with a gun that would shake, for many of them do an enormous amount of shooting, and know a good gun as well as anybody.

Mr. Atkin has bored and regulated some guns for No. 4 and No. 5 shot, of the shooting of which he speaks most highly; thus for Mr. Walter Long, of The Holt, Bishop's Waltham, he regulated a gun to shoot with 1oz. of No. 5 shot, 142 with the right and 165 with the left barrel. For Major Henderson he regulated a gun to shoot with $1\frac{1}{2}$ of No. 4 shot, 95 pellets in the 30-inch circle with the right cylinder barrel and 135 with the left, the cylinder barrel penetrating, with three pellets, thirty-five sheets of the Pettit pad.

Some other shooters who use his guns are Mr. W. G. Craven, Mr. Shelley Bontein, Major Wynne Finch, Lord Ilchester, Hon. G. O. Gore, Lord Stavordale, Mr. W. H. Grenfell, Col. Pole Carew, Mr. Lloyd Price of Rhiwlas, Hon. S. Fortescue, and Hon. Walter Rothschild, besides a lot of others equally well known, none of whom in shooting can allow others to be better armed than themselves, which is saying as much as they can say for the skill and care of the gunmaker they employ.

CHAPTER XXI.

MR. FREDERICK BEESLEY.

SINCE 1880 Mr. Beesley's name has been honourably known amongst the members of the gun trade. Before that time he was working for Mr. Purdey, and designed the hammerless action which that celebrated gunmaker still, after eighteen years of use, employs. Than this no higher praise is possible. The principle of this action is that the closing of the gun compresses the main spring of the lock and brings it into tension on the tumbler, which has previously been cocked by the opening of the gun; the tumbler is on the rebounding principle—that is, it is put at full cock by the opening of the gun, but it is only as the gun is closed that the main spring is compressed and is brought to bear upon the tumbler. This compression is brought about by the backward movement of the cocking rod acted upon by the barrels as the gun is closed. This rod presses downwards the upper arm of the main spring, while the lower one is firmly held by the sear of the tumbler, in position for its trigger connection. On the trigger being pressed this lower arm of the spring flies downwards, and now the spring is fully extended, only it is in a lower position than it was when the gun was open. The opening of the gun puts back the tumbler to the position of full cock, and at the same time the upper arm of the spring moves upwards, drives forward the cocking rod, and so assists the opening of the gun with a spring—the well-known peculiarity of Mr. Purdey's guns. We do not suppose that sportsmen are likely to agree as to superiority between the use of force to open or to close the gun; it is a matter for individual taste, but one thing is undoubtedly gained with the system of compressing the spring by the closing of the gun—it is that

there is no necessity for the use of dummy cartridges with which to safely let down the tumblers before taking the gun to pieces to put it away.

Mr. Beesley used this principle of compressing the main spring by closing the gun for his own guns until he patented his ejector, a beautiful movement, and the most simple possible, and, as this was not suitable to work with the hammerless action he had sold to Mr. Purdey, he adopted the well-known Rogers action for his own guns, by the use of which he was enabled to adopt his own ejector system. This invention consists of two pieces only, a spring and a cam or striker, fixed in the fore end, and the whole extracting or ejecting movements are effected by these two pieces; they are so shaped that in concert with the cocking rod various notches cut into them only come into action upon opening the gun after the trigger has been pulled. Mr. Beesley has invented several other actions, and these he has sold to well-known makers, and they have already been noticed by us. The ejector just referred to he has also sold a right of to one other gunmaker, who uses it in conjunction with himself.

In considering the value or the cleverness of an invention it is necessary to consider it in the light of the knowledge that was prevalent at its date. This Purdey hammerless action so regarded comes out very high indeed. In 1880 the question that gunmakers were considering was not ejectors, but the best means of cocking the tumblers of hammerless guns. The barrel cocking mechanism had not at that time entirely ousted the lever cocking actions. Moreover, this was a distinct advance over the best barrel cocking mechanisms because, in the days before ejectors, an assistant spring in opening the gun was a distinct advantage. Often in those days cartridges stuck in the guns, and it was no uncommon thing for a good deal of force to be necessary to remove them. Cartridge extractors were in common use, and we think that although freedom of opening the gun had little effect in cases where an extractor was wanted, yet it frequently happened that in somewhat less tight fits it made all the difference, to the time necessary for reloading, whether the gun was smartly opened or not. Moreover,

there is no doubt that this invention saved a good deal of strain upon the hinge, and this advantage remains. When the hand alone forces open, and by the same movement cocks the gun, there is pressure exerted which becomes jerk upon the hinge as soon as the resistance has been overcome ; when a spring is used to assist the hand to open the greatest force is then applied at first, and this diminishes as the gun opens, so that no jerk is felt. The opening begins fast and ends slowly, instead of beginning slowly and ending with a jerk.

From the foregoing remarks it will be seen that Mr. Beesley was eighteen years ago considerably in advance of his time. Of course, it is well known in the gun trade who works this inventor's later inventions besides himself, but as every man has a right to that which he has paid for, perhaps it would be making undue use of the names of others to publish the information that they have paid money to suppress. It is enough to state that Mr. Beesley holds in London very much the position Mr. W. P. Jones holds in Birmingham ; he is the principal inventor for the trade.

We have said nothing yet about the character of the finished article that Mr. Beesley turns out. His best guns bear the impress of the highest skilled labour, and an expert would identify them as London guns, even if he came across them in Timbuctoo.

Mr. Beesley likes to set his guns so that the shooter should look over the breech end of the rib about one-third of an inch. Some of us like to get down to the rib a little nearer than that. But there is no doubt that this style of aiming is that adopted by the majority of shooters. In the old days when pigeon shooters set the fashion, nearly everybody shot in that way, but now that the majority of game is killed as it comes towards the shooter, some of the half-over and half-side shots seem to require almost rifle-like accuracy to get them in the centre of the shot.

We hear that Mr. Beesley has had considerable success in fitting customers in the shop, but he has a try-gun, of course, with which at the shooting range he gets the fit when there is any doubt about it. This weapon is much lighter than the majority of try-guns, and this is a great point, for

there can be no doubt that a heavy, badly balanced gun is never likely to find the right shape of stock for a lighter and differently balanced weapon. This gun being the average weight of a 12-bore, and very conveniently made besides, is not likely to mislead.

Mr. Beesley has one or two single-trigger patents; he informs us, however, that he is not yet satisfied with anything of his own, nor with any of the others. We ask why, rather in surprise at this, and the answer surprises us more; he tells us that he can make any of them go wrong by the peculiarity of holding, and he says that what a gunmaker can do intentionally his customer is liable to do accidentally. In regard to the best single-trigger guns of the three-pull system, he says he can so hold the gun that when shooting three pulls become necessary just as they are when there is no cartridge in the gun, and it is snapped off in the shop. He does this by placing the finger at the side of the trigger and not fairly upon it. He admits that this argument might be used against the pull necessary for a revolver, and that if the finger was not fairly upon the trigger and fairly released after the first shot, there could be no second shot.

To us the possibility of sending a gun wrong has no charms, and we have never tried to do it when trying single-trigger guns. We have always looked at the gun as a weapon to make the most of, and do the best with that we were able, and, perhaps therefore, as a matter of fact, we have not yet had a single-trigger go off both barrels together, and although we failed to get the second barrel off with some of them at the first time of asking, it was only for the first ten minutes or quarter of an hour. The failure was undoubtedly in consequence of our not letting go the trigger. This we very soon learnt to do, and have had no failure since, although we do not habitually shoot with single-trigger guns. We think that if the two things had to be learnt from the start, the habit of moving the finger from one trigger to the other would certainly take longer to acquire than that of merely releasing the trigger before pressing again. That is our view; as we have said, it is not Mr. Beesley's, and he is now at work upon a new single-trigger

with which he hopes to satisfy himself and to improve upon everything out.

Mr. Beesley has been at No. 2, St. James's Street since 1891, and for seven years prior to that he carried on a business of gunmaking in Edgware Road.

He began in the gun trade at fifteen, as an apprentice in the old firm of William Moore and Grey, of Old Bond Street, while one of the partners (Grey) was yet alive and in



MR. FREDERICK BEESLEY.

the business. Since then he has worked for all the great London firms excepting that of Grant, finishing with Messrs. Purdey.

Writing to us, he says :—

" I have two patents for single-triggers, one of which is selective, and you will be interested to learn that the one I showed you on Tuesday, with the time stop and two pulls only, has had half-a-dozen shot put through it this morning with perfect success, and as it is only in a very rough form, I believe it will, when perfected, be one of

the best, for, as you know, it cannot well be simpler. I shall have pleasure in submitting it to you when completed."

The following is a list of the patents for hammerless guns invented by Mr. Beesley :—

Date.	Subject.	Used by
3 Jan., 1880	Hammerless Gun.....	James Purdey.
14 Feb., 1883	Ditto	F. Beesley.
14 April, 1883.....	Ditto	Cogswell & Harrison.
6 June, 1883.....	Ditto	James Woodward.
2 Jan., 1884	Ditto	F. Beesley.
18 Feb., 1884	Gun Locks	Provisionally.
18 Aug., 1884	Block Safety	Cogswell & Harrison
1 Nov., 1884	Ditto	F. Beesley.
3 Mar., 1885	Hammerless Gun.....	Provisionally.
31 May, 1886	Ejector Gun	Ditto.
2 July, 1886	Hammerless Gun.....	F. Beesley.
24 Jan., 1887	Ejector Gun	Ditto.
31 Dec., 1889	Ditto	Ditto.

A NEW SINGLE-TRIGGER GUN.



There is no doubt that gunmakers are laying a great deal of stress just now upon the absence of unnecessary pieces in the mechanism of their guns. We do not wonder at this, for every part of the hammers and the ejector movement have been crowded into the woodwork that used in the days of hammers to be solid walnut ; anything, then, that tends to lessen the number of pieces so as to avoid cutting away wood is an advantage from the gunmaker's point of view. The shooter naturally has been educated in these advantages also, and has come, through the education which gunmaking competition gives, to look for a weapon in which the pieces are few.

Mr. Beesley, of 2, St. James's Street, has managed to make a single-trigger that has just the same number of parts as a double-trigger gun. Under each illustration is the maker's description of the mechanism contrasted with the number of pieces in an ordinary two-trigger arrangement.

The points claimed in favour of this are that it requires no intermediate pull to enable the second trigger to be pulled. In fingering the weapon in its unloaded condition

a very slight relaxation of the muscles of the finger is necessary, but in actual shooting it acts as a straight pull. That is to say, a continuation of pull from the first pull lets



FIG. 1.—This represents the “Straight Pull” Single Trigger, complete and ready for firing the first barrel. When the finger pulls the trigger backward, the small key  is lifted upward out of the recess 1, and fires the first barrel. The fan-shaped piece then revolves until the recess 2 is over the key , when the second barrel may be fired.

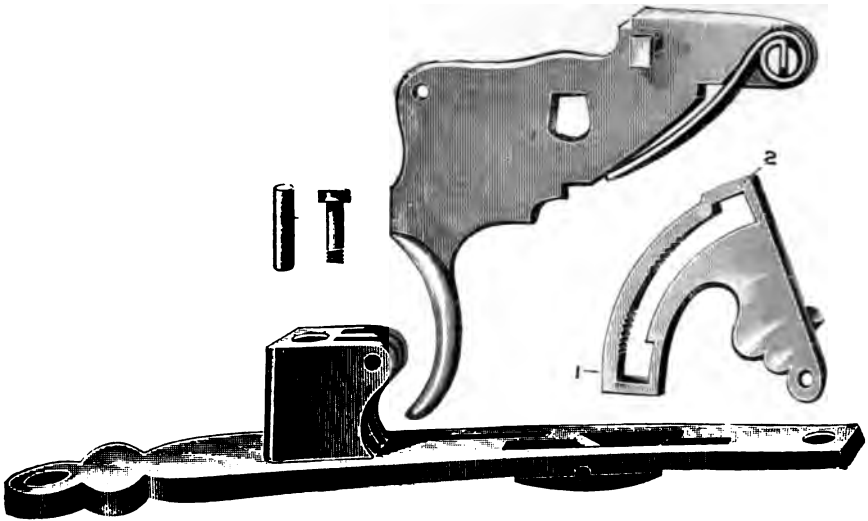


FIG. 2.—This represents the whole of the limbs of the “Straight Pull” Single Trigger mechanism, comprising, with the spring attached to the trigger, six pieces only.

off the second barrel without the shooter being at all aware that he has released the pressure of the finger. The kick effectually releases the finger pressure sufficiently to enable

him apparently to go on pulling as if he had never left go for the second barrel.

The fan-shaped piece is serrated, and flies forward on the relaxation of the muscle after the first pull until the second, or rear, square opening comes into position for the key, and allows the trigger, of which the key is a part, to be still further raised to bring the trigger in contact with the second barrel sear. Now, it will at once appear that the successful action of this mechanism must depend upon the speed of the explosion as compared with the speed of the spring that sends forward the fan-shaped piece into position for the pull for second barrel. If the explosion was too slow or the spring too quick there would be danger

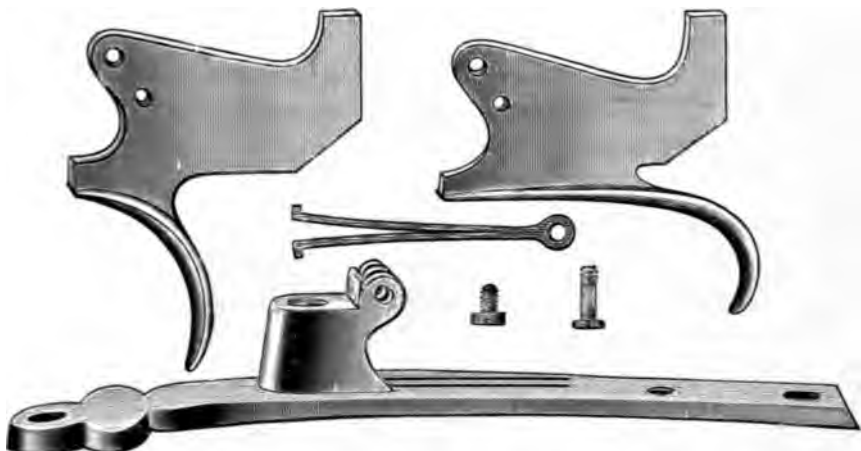


FIG. 3.—This represents the whole of the limbs of the ordinary Two-Trigger mechanism, numbering also six pieces.

of two simultaneous explosions from the mere action of a straight pull.

We do not know how far the involuntary pull after recoil may serve to retard the forward action of the fan-shaped piece, but we imagine that it is so retarded, for we know that pressure before the fan piece has come fully forward will stop it, and we are aware that there is always an involuntary pull consequent on recoil, and that this, of course, necessitates pressure.

Although gunmakers will appreciate the smallness of the number of pieces, we fancy shooters do not judge of a

gun in quite the same fashion. We have always considered that the proper way to test a single-trigger gun is to shoot at objects right and left that necessitate the quickest possible work. The whole question turns on the second barrel work, and the quickness it can be got off without any risk of a double simultaneous discharge. When we have had single-trigger guns to report upon we have therefore usually had double rises from the clay bird tower thrown over us, and got off both barrels in all cases without turning round. This system we adopted with Mr. Beesley's gun, shooting the clays from the same tower as in the competition at the London Sporting Park. We had about 250 shots in quick time—that is as fast as we could cool the gun enough to hold it, and no accident of any kind occurred. In fact, the gun shot as perfectly as we could wish, the second barrel never once failing to go when required, and no simultaneous discharge whatever taking place throughout the trial, with various heavy and light loads. The following is the score we managed to make with the gun of all shots taken after counting was begun :—

10 11 11 11 11 11 10 11 11 11 01 11 10 10 11 10 11 01 11 11 01 11
 11 10 11 01 11 11 11 11 10 10 00 11—54 out of 68; 42grs. E.C., 1½
 No. 6.

11 11 10 11 11 11 11 10 11 11 11 10 10 10 10 11 11 11 11 11 10 11
 10 10 10 11 01—Various charges; 43 out of 54.

11 11 11 11 11 11—12 out of 12; 47grs. Amberite, 1½ No. 7 shot.

Total 109 out of 134.

CHAPTER XXII.

BOSS AND Co.

THERE was a time when nobody could shoot pigeons at Hurlingham or the Gun Club without previously consulting one of the three gunmakers, Boss, Grant, or Purdey. There are fashions in gunmaking as in most things, and fashions usually have some good reason at bottom. The reason of this fashion was that Boss, Grant, and Purdey were the only gunmakers who regularly attended the meetings, either themselves or by representatives, and were ever on the spot, and ready to assist their customers, and to do their best to help them to win. Pigeon shooting became unfashionable when the Princess of Wales expressed her intention of avoiding, for the future, the then fashionable meetings, owing to her dislike of the habits of wounded pigeons, and to their inability to differentiate between the lap of royalty and less elevated situations in which to die. About this time there was very little for a gunmaker to do at the meetings, and it was then that Boss and Grant retired from constant attendance, and practically left the entire field open to the longest stayer, who proved to be Purdey. Therein the latter exhibited his well-known excellent judgment, for pigeon shooting has been to him a standing advertisement. Moreover, as pigeon shooting is the only metropolitan form of introduction between shooters, as shooters, it soon became evident that the shooting man about town must sooner or later become acquainted with some of the gun lore stored up in the brain of Mr. James Purdey.

Boss and Co. was founded seventy years ago, by Thomas Boss, a workman under the celebrated Joe Manton. There used to be but one gunmaker, that was in the time of

Joe Manton; after his death they were all gunmakers; that is to say, all his best workmen became gunmakers for themselves, and the best of gunmakers. The unique position held by Joe Manton is never again likely to be realised by a gunmaker. On his retirement, his workmen, Thomas Boss, Charles Lancaster the elder, James Purdey the elder, William Moore, the founder of the firm of Moore and Grey, and we know not how many more besides, became working master gunmakers, to whom every part of each gun they made was known, and examined and often actually worked upon by the gunmaker himself. There are a few men of this stamp who have appealed to sportsmen on their own merits within the past few years, but until that period the class had died out. Mr. John Robertson was one of the first, six years ago, to revive the old order of working London gunmakers—the class, be it remembered, to whom “a London gun” owes its reputation the world over. The difference between the master gunmaker, or go-between, or middleman, who is the salesman and is not the working gunfitter, and the master gunmaker who is a worker is enormous. It was the latter that made the reputation of London as a gunmaking centre, and it is easy to see that, in the opinion of as good a judge as Colonel Peter Hawker, in the beginning of the century, Joe Manton himself depended for his reputation on the barrels made for him by Charles Lancaster the elder—that is, on one of the first of the working master gunworkers. We know that a new demand has arisen. The manufacturer and the shopkeeper have taken to shooting in their holidays, and for their particular benefit the gunmaking sportsman has been evolved. The man who can only spend a limited time with the gun requires not only a gunmaker but a shooting coach to assist him; whereas the man who is a sportsman because he cannot help it—because the surroundings of his youth were sport—requires nothing but the gunmaker. Mr. Robertson is only the gunmaker. If by chance it happens that his customers require the assistance of an expert fitter they are handed over to one. At present it is to Mr. Watts, of the London

Shooting School, that they go, whose success has been very great, and whose quickness of insight into the faults of a shooter are remarkable.

It happens that the name Boss has always been one of the very few to possess a genuine right to be known as London gunmakers.

To most shooters a gun from a London shop is a London gun—we are not sure that they do not include the stores; but for the benefit of those not “in the know” we may state that “Boss and Co.” are, and have been for years long past, in every sense of the words London makers, for they supply only guns built entirely in London, and of the best materials, and at the best price.

Thomas Boss, the founder of the business, served his apprenticeship with his father, one of the best of Joe Manton’s workmen. After this he then worked for some years for the late Mr. J. Purdey (founder of that firm); this was from 1817 to 1821 and later. As a coincidence it may be mentioned that the present proprietor of Boss and Co. worked for about ten years for the present Mr. James Purdey, now head of that firm.

Thomas Boss commenced business for himself as a gun-maker in 1830, at 3, Grosvenor Street, thence removed to Clifford Street, thence to 76, St. James’s Street, and finally to 73, St. James’s Street, the present address of the firm.

Mrs. Boss succeeded to the business at the death of Thomas Boss, and took Mr. Stephen Grant into partnership about 1860 as manager. At the expiration of the partnership Mr. Grant started business for himself. The next successor was a nephew of the founder of the firm, who carried on the business up to 1891, when he took the present proprietor, John Robertson, a native of Haddington, into partnership. It was his father, who carried on a gun business for 60 years in the old town of Haddington, who first fitted telescopes to rifles, Colonel Davidson and several other sportsmen having had them fitted nearly half a century ago, as is proved by the old books of the late Mr. Robertson, now in possession of Boss and Co.

John Robertson left Haddington at nineteen to enter the

employment of the late Sir Joseph Whitworth at Manchester. After learning all the secrets of rifle making at Manchester he migrated to Westley Richards in Birmingham. Then, for the next ten years, we find him in the employment of Mr. Purdey.

Having thoroughly mastered his trade, he commenced to manufacture for the gun trade, at first principally for Mr. S. Grant, but afterwards for nearly all the gun trade, and during this period he stocked, screwed, and finished the guns which obtained the gold medals at various exhibitions for Messrs. Grant, Lang, and Holland.

Besides being a skilled workman he was an inventor, and his first patent was for an intercepting safety for hammerless guns; and this he sold to Messrs. P. Webley and Son, of Birmingham.

We next find his name coupled with that of Mr. Henry Holland (of Holland and Holland), as co-patentee in several patents for hammerless guns and ejectors, and he admits his indebtedness to the patience and perseverance of one of his present workmen, W. Adams, who has been associated with him in solving the problem of a successful "single-trigger" gun. This invention, by the way, had defied the efforts of gunmakers for nearly half a century, and had been given up completely in connection with hammerless guns. Whoever may reap the benefit of this invention, it will be always remembered to the credit of John Robertson that he first found out wherein the difficulty lay.

To see Mr. Robertson in his work apron, few would guess his position as leader in his trade of the latest movement, and the one that all others are endeavouring to imitate. He makes no pretence of any sort, but is to be found all day and every day in his workshop at his bench in his shirt sleeves.

In the front shop the sale department is left entirely in the hands of his courteous and energetic manager, Mr. Embleton, who has long been well known to the patrons of the firm. Mr. Robertson is personally and practically the centre of his business. His heart is in it, and whoever gives him an order for a gun may depend on obtaining honest and

thorough London work, such as few can equal and none excel, for the building of a gun is to him a labour of love. There are so many patents of one-trigger guns now that some people may forget that the credit is due to Mr. Robertson of the first discovery and publication of the principle on which they should be made. This principle has been previously explained, by us, as follows :—

“ Much has been done since in this direction, but up to that time all attempts had failed, because no means had been devised of preventing the involuntary discharge of the second barrel. Mr. Robertson discovered that the reason of this involuntary jar off, as it was called, was not a jar off at all, but was caused by the action of the gun in recoil and recovery upon the trigger finger. That is to say, the contracted muscles of the finger are, more or less, released from contact by the backward action of the gun, and are then again brought into contact by its subsequent forward movement. So that where the intention was to pull the trigger once only, a double pull was, in fact, effected. It was only necessary to know the cause of previous failure to make use of the knowledge, and Mr. Robertson immediately applied himself to the task of making use of that recoil and recovery that had hitherto been a nuisance. Consequently he designed an action that depended for its efficiency upon this nuisance; that is to say, the first backward and then forward movement was made a necessity to the working of the action, and without it there is no right and left possible, in the ordinary sense, in the Boss one-trigger gun.

“ We are used to pay deference to those scientific people who first recognise the existence of a force that was unknown before. It very seldom happens that the discoverer of such a force is he who applies it to everyday uses. This Mr. Robertson has done. It may be said, of course, that we all know of the backward and forward movement of the gun, and that is quite true. What we none of us knew was that the muscles of the trigger-finger retained their contraction during the whole time of these two movements. That is what is remarkable about Mr. Robertson's discovery—viz., that he was the first to recognise the facts as they are, and that, having recognised them, he immediately set to work to make them useful instead of hurtful, and has made a single-trigger gun that is safe where two triggers are dangerous.”

Means have been devised by various patentees to overcome this involuntary action; all of them, however, seek to make it necessary, for their usefulness, that the

following movements should take place after the discharge of the first barrel, first an unconscious release (partial or not), and, then, unconscious pressure by the trigger finger. The release is caused by the rearward action of the gun, consequent on recoil; and on its rebound from the shoulder the second pressure of the trigger occurs. Not until both these actions have taken place should the second sear come in indirect contact with the trigger. We are inclined to think that all those patents, whether called double- or treble-pull systems, depend on the same involuntary actions for



MR. JOHN ROBERTSON.

preventing an involuntary discharge of the second barrel. It is true that a weak spring takes more time to do its work than a strong one takes to do similar work; and that it may be possible to so adjust a spring as to make it act over a space of time, when placing the trigger in direct communication with the sear of the second barrel. The aim would be to make the spring take up just such time as the recoil and reaction from the shoulder took up. If this is possible (without the assistance of the mechanical action of recoil and reaction) it would argue that both recoil and

shoulders must be constant quantities : otherwise, the spring might be too late or too quick in bringing the trigger into play with the left sear. It would, moreover, be necessary that a delicate spring should not be subjected to corrupting influences, that oil must never clog nor rust deteriorate the metal. We know that this delicate work is possible, for we have a great instance of the regularity of the action of a controlled spring in a chronometer. Nobody, however, has ventured to advocate this method of controlling the time of a spring in the action of a gun, and we do not think that they ever will.

It follows, therefore, that those who are successful in the use of a weak spring for placing the second sear in communication with the trigger, rely, more or less, also, upon both recoil and second involuntary pressure on the trigger to assist the timing of their spring. That, at any rate, is our opinion.

There is, however, one early patent, greatly relied upon, that we do not think comes within this description, for although it relies upon a spring, we do not think it necessary with this patent that there should be any second pressure to bring the swinging arm under the second sear, ready for the second barrel to be fired. It appears to us that release alone, after the fall of the right tumbler, before, or caused by, recoil, would put the trigger and left sear in communication, ready for firing, and that reaction from the shoulder might fire it. We speak only of the patent specification, and without knowledge of its possible modifications since. But in our view this gun is not one that can only be fired after reaction from the shoulder, but one that can only be fired after the fall of the right tumbler.

However this may be, the production of a reliable single-trigger gun has occupied the attention of gunmakers for a century, and the first knowledge we have of success came from Mr. Robertson and his invention. He works to satisfy himself, as the hardest of taskmasters, and is careless of outside opinions when he is satisfied with his own.

Four and a-half years ago we were first made acquainted

with the gun that has since been the subject of public trial. The outcome of that trial is now well known ; the mechanism having been tested in a double 4-bore rifle, with sixteen drams of black powder and a four-ounce spherical bullet, and also with a charge as low as two drams of powder and one ounce shot in a 12-bore gun. The heavy charge failed to jar off the second barrel, and the light charge was yet heavy enough to set up enough recoil and reaction from the shoulder to put the trigger in communication with the second barrel.

After the guns had had a season on the moors, Messrs. Boss offered a further public test, and invited anyone to bring a two-trigger gun with the left pull reduced to 1 lb., and staked their reputation on their single-trigger standing the test as against the two-trigger with any weight of pull.

This second trial was well attended, and again Messrs. Boss came through triumphant.

Another season on the moors still further proved the thorough reliability of their patent single-trigger, and now we can state that for the present season the proportion of their orders now being executed is over two to one in favour of their single-trigger.

Imitation is the sincerest form of flattery, and the number of single-trigger patents that have been applied for by gun-makers, all over England, ought to make Boss and Co. feel satisfied with their position.

Whether many of these patents are infringements does not concern us or shooters : but we happen to know that professional opinion, on which gunmakers have lately much relied, is in favour of the Boss patent.

To make himself safe, Mr. Robertson has taken that counsel's opinion we have mentioned, on whom the gun trade has recently relied. He has made models, and fitted up guns, on the various published specifications, and is perfectly satisfied with the opinions he has obtained. We think that it is just possible that his claim is not perfectly understood by his brother makers, and that law actions might, and ought to be, avoided.

We might here mention that after long delay, much

correspondence, and the swearing of several affidavits, the interference of Mr. Thorn was set aside, and the American patent for a single-trigger gun granted to Mr. Robertson. As patents in America are only granted after a thorough investigation by a committee of experts, it must be satisfactory to Boss and Co. to know that their claim has been admitted in its entirety, evidently showing Americans are alive to the essence of the patent utilising the involuntary



A "BOSS" GUN, SHOWING THE UNFIRED CARTRIDGE EXTRACTED TO THE FULL LENGTH, THE FIRED ONE READY FOR EJECTION.

pull for the purpose of putting an interceptor out of operation, and preventing the mechanism going into position for firing the second barrel until *after* the involuntary pull.

Besides his one-trigger gun, Mr. Robertson has just perfected an ejector which has the advantage of withdrawing the cartridges to the fullest extent of the extractor when not fired. We give a photograph of this gun with one unfired

cartridge thus far extracted. The mechanism is extremely simple and perfect in its working.

Mr. Robertson's attention having been drawn to the fact that guns with light pulls have sometimes been jarred off by the smart closing of the gun (a similar fault is generally caused by a sticky striker which is not withdrawn by the cocking of the gun), he has patented an interceptor by means of which discharge from jar-off upon closing the gun is rendered impossible.

Below we give the claims from Mr. Robertson's American patent, more for the benefit of the gun trade than as of interest to sportsmen.

Copy of claim from American patent No. 582,094, dated May 4th, 1897.
Application filed April 19th, 1895.

1.—In a single-trigger double-barrel gun, the combination of two sears, a horizontally-oscillating sear-actuator, a trigger for the first sear and said sear-actuator, means for holding said sear-actuator out of operative connection with the second sear during the firing and recoil of the first barrel, and means for causing said actuator to engage the second sear after the recoil of the first barrel.

2.—In a single-trigger double-barrel gun, the combination of two sears, a sear-actuator, a trigger for the first sear and said sear-actuator, means for locking said actuator out of operative connection with the second sear during the firing and recoil of the first barrel, means for causing said actuator to engage the second sear after the recoil of the first barrel, and means connected with the locking bolt of the gun-barrel for restoring said actuator to normal position.

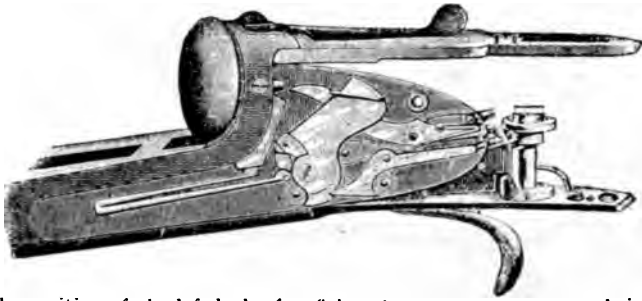
3.—In a single-trigger double-barrel gun, the combination of two sears, a swivelled spring-actuated actuator for the second sear, a trigger for successfully operating the first sear and said sear-actuator, and a lock for locking said sear-actuator out of operative connection with the second sear during the firing and recoiling of the first barrel.

4.—In a single-trigger double-barrel gun, the combination of two sears, a swivelled vertically-sliding spring-actuated actuator for the second sear, a trigger for successively operating the first sear and said sear-actuator, and a lock for locking said sear-actuator out of operative connection with the second sear during the firing and recoiling of the first barrel.

5.—In a single-trigger double-barrel gun, the combination of two sears, a sear-actuator for the second sear provided with intercepting arms, a trigger for actuating the first sear and said sear-actuator.

abutments or arms engaging said arms on the sear-actuator for holding it out of operative connection with the second sear during the firing and recoiling of the first barrel, and means for releasing said sear-actuator after the recoil of the first barrel and causing it to engage the second sear.

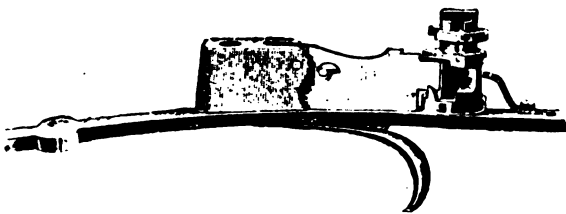
6. —In a single-trigger double-barrel gun, the combination of two sears, the first of which is provided with abutments or arms, a sear-actuator for the second sear provided with an intercepting arm, a



Showing the position of the left lock after firing the right, the left sear being blocked and prevented from rising until the trigger is released after the involuntary pull.

trigger for actuating the first sear and said sear-actuator, said abutments or arms on the first sear being adapted to engage said arm on the sear-actuator for holding it out of operative connection with the second sear during the firing and recoiling of the first barrel, and means for disengaging said abutments or arms after the recoil of the first barrel and causing the sear-actuator to engage the second sear.

7.—In a single-trigger double-barrel gun, the combination of two sears, a sear-actuator having an intercepting arm adapted to engage



The One-trigger Mechanism, showing the stops before and after the involuntary pull.

the first sear, means for automatically shifting said actuator into engagement with the second sear, and means for holding said intercepting arm in engagement with said first sear until after the firing and recoil of the first barrel.

8.—In a single-trigger double-barrel gun, the combination of two sears, a sear-actuator having an intercepting arm adapted to engage the first sear, means for automatically shifting said actuator into

engagement with the second sear, means for holding said intercepting arm in engagement with said first sear until after the firing and recoil of the first barrel, and a projecting arm on said sear-actuator adapted to operate the second sear after the firing and recoil of the first barrel.

9.—In a single-trigger double-barrel gun, the combination of two sears, the first of which is provided with a fixed abutment of arm, and with a spring-actuated pivoted abutment, a sear-actuator provided with an intercepting arm adapted to engage successively the fixed abutment and the pivoted abutment on the first sear, and means for releasing said intercepting arm from said abutments after the firing and recoil of the first barrel.”—*May* 22, 1897.

This excellent weapon has now stood such a good test of durability that it has, we fear, created some envy, hatred, and malice on the part of some less successful inventors. Two years ago, when we were in Birmingham, we heard this single-trigger spoken of as delicate in mechanism and unlikely to stand wear and tear by reason of its watch-spring like arrangement for turning the turret, which is an essential part of the mechanism. This turret, by the way, has been very exhaustively misdescribed in an article addressed to the gun trade in *Arms and Explosives*. There the mechanism is described thus: “The capstan is raised each time the trigger is pulled”; but this capstan or turret is not raised each time the trigger is pulled, and it is, as a matter of fact, only raised once in the three pulls. That is to say, the first pull for the right barrel does not raise it, the involuntary pull does not raise it, and the third pull alone raises it.

We think that accurate description is within reach of us all, and it is only misleading and the encouragement of unprofitable lawsuits to misdescribe one or more of the inventions involved. It is of great interest, however, whether these Boss guns are as delicate as they are said to be. We have ourselves entertained doubt about their stability, a doubt which has been set at rest by the constant use of a large number of them in the field for two seasons. We remember that we expressed the doubt we had by saying that nothing but a long experience of the guns in the field would settle the question finally, and discover the weak place we had failed to find, if there was one. Some hundreds of the guns

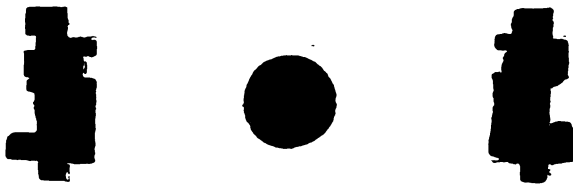
have now been out for two seasons, and there is no failure to record, so that we were somewhat too careful in making the reservation we did.

The doubt expressed by some of the trade having come to the knowledge of Messrs. Boss (not, by the way, by our interference), Mr. Robertson, the inventor of the system,



THE SINGLE-TRIGGER BOSS GUN.

straightway designed some experiments that should be a complete answer to the charge of weakness, and he was good enough to invite us to see these carried out. They consisted of making the single-trigger parts of a material many times weaker than the steel of which they are ordinarily made. The actual strength of the material as com-



The wooden turret in three positions ; the middle one showing the spring at the base.

pared with steel we do not know. Steel is thirty times as resisting to pressure as tin, and it is nearly sixty times as resisting as zinc ; but a weaker substance than either of these was selected by Mr. Robertson for his test, viz., boxwood. It is obvious, of course, that the spring could not be made of wood, but that was unnecessary, as the

spring is fastened to the pivot at one end and to the turret at the other, by means of a pin no thicker than an ordinary sewing needle; and these two pins were, for the experiment, made of boxwood the exact size of the steel pins ordinarily in use with the steel pivot and turret. We give photographs of various positions of the wooden turret with the pivot inside it, and the spring in its base fastened, as we have said, by the wooden pins. Thus with the actual wooden mechanism in the gun from which these photographs are taken we were asked to shoot the gun. We took ten cartridges of the ordinary load for this purpose, and fired them as quickly right and left as the single trigger enables (very much quicker, be it said, than is possible with a double trigger), and then we saw the wooden mechanism taken out of the gun and brought it away for the purpose of these illustrations. Taking zinc to be of the same strength as boxwood, we have therefore sixty times greater strength than necessary in this mechanism; that is, 6,000 per cent. greater strain resistance than the strain employed. We think that had Mr. Robertson thought of this method of test before, it would have been unnecessary to make any reservations whatever when we were describing the doings of his single-trigger system. To those shooters who like a light pull-off of between one and two pounds the advantage of this system cannot be over-estimated, as the sear for the second barrel is automatically held firm during recoil, so that it cannot jar off even with the heavy loads which have been employed to test it.

We have counted over forty patents and inventions since we first noticed this gun, all designed to compete with it. As imitation is admittedly the sincerest form of flattery, we may fairly congratulate Mr. Robertson upon setting the fashion in gunnery, and ourselves upon being the first to publish the merit of the new fashion and to describe it.

A SINGLE-TRIGGER THREE-BARREL GUN.

During 1898 we became aware that Messrs. Boss, of St. James's Street, had been at work at a triple-barrel

ted by a single trigger, and we have tried the weapon at birds thrown over head, three at a time. Our idea in



SIDE VIEW OF THE THREE-BARREL SINGLE-TRIGGER.

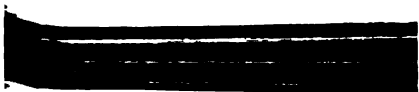
uting this trial was to test the question whether it was able to get three barrels in at a covey of coming ridges, or a pack of grouse, before turning round. We

can well understand that there will be many sportsmen who will repudiate the thought that it should be made easier to kill game than it is already. But we have to look at what is ; and we cannot help noticing that all the tendency of the departing century has been to facilitate the methods of the shooter, and, strange as it might appear to those who condemned; in turn, the detonator, the breech-loader, the central fire, the hammerless, and, last of all, the ejector, the increase of game has kept pace with all the improved methods for its destruction. There is reason for this : that the demand creates the supply is no doubt true, but it is not all the explanation. It has come to be a well recognised maxim in the management of a sporting estate that the less often game is disturbed and frightened the less likely it is to permanently leave the ground. This fact is one of the good causes for big bags, and the preference for shooters that can make them. It resolves itself into this, that the bigger the bags made on the great shooting days, the more an estate yields for the money spent upon it in preservation.

There is a very well recognised characteristic about game birds, especially grouse and partridges, that, once understood, excuses or justifies the longing of naturalist sportsmen for big bags. The best gamekeepers hate to see their game driven about for nothing. They are fully aware that every time it is so driven a percentage of it is lost to them and gained by their neighbours. It might be said that after birds have been driven about all the morning it does just as much harm to continue driving them all the afternoon as it would to come at them another day - that it is the number of shots at them that drives them away permanently, and so on. It might be said, it is true, but only by people who do not understand the character of the birds they are talking of. When birds are broken up and bewildered, as they are after a morning's driving, all the extra driving and shooting at them in the afternoon will have no effect in permanently driving them off their own ground. Their first instinct on being left alone will be to find each other again, and to come together their method is to return to their own ground and call. But when they have once done this their experience

of driving results in a dread of the drivers, which takes the **form** of extreme wariness, and results in much longer flights **when** disturbed than they formerly took.

These long flights are impossible to control, and one such **flight** may lose the birds for the day: frequently repeated, **they** may lose the birds permanently. Grouse have a **wonderful** way of distinguishing danger. In the Highlands **there** is no better way of making a bag late in the season **than** that of imitating the dress and the dog of the shepherd **and** going his rounds. This method brings the sportsman **within** range of grouse that would not have remained in the **same** parish with him had he taken out his liver-and-white pointers or his lemon or black-and-white setters. Moreover, **when** a shepherd flushes grouse late in the season they only **fly** short distances out of his way, unless otherwise alarmed **than** by him; but let a line of drivers flush the same birds



TOP VIEW OF THE THREE-BARREL SINGLE-TRIGGER.

and the difference of flight and intention of the birds is obvious at once.

All this is as well known to many men who try and make big bags as it is to their keepers. In fact, the fashion for big bags is the outcome of the gamekeepers' fight with nature. Nobody may be less able to explain the characteristics of a game bird than the average gamekeeper, but nobody knows them as well. Big bags, that is, comparatively big with what has been done before, are, and always have been, the ambition of the gamekeeper—the man, be it remembered, who is responsible for the next year's stock of game. This is true of the keepers, whether their business is to look after grouse, partridges, or pheasants. Every sportsman who talks with this class, and gets to know and understand their feelings, discovers that their craze for big bags is not usually accounted for by the desire to “swagger,” but in order to further the due preser-

vation of game. It is that a certain head of game has got to be killed, and the less they drive away in the operation the better they like it. They hate to see game wounded no more than they hate to see it driven away. The Earl of Suffolk thought we should come to repeaters for game shooting, but a repeater is at best a clumsy affair, out of which it is impossible to get a double shot as quickly as out of a double-barrel.

The attempt to use guns of more than two barrels for game shooting is not new, as Mr. Charles Lancaster made a four-barrelled gun years ago. This weapon had the disadvantage of a very heavy pull off. It was necessary for the trigger finger to cock before it could let off the striker, and consequently all delicacy of pull was out of the question, and that instantaneous working together of eye and hand which is a necessity in first-rate shooting was, at the least, made more difficult of accomplishment.

If it is a fine feat of sportsmanship to kill right and left two birds coming absolutely together over the gun, it can hardly be denied that it is much finer to kill three. There is a question, of course, whether any shooter without turning round can kill three coming over him absolutely together with the wind behind them; but birds do not, as a rule, come absolutely together, there is always more or less stringing of the covey, and more still of the pack.

Mr. Watts, of the London Sporting Park, has endeavoured to train his assistants to let off clay birds in such a manner as to imitate the little stringing there is in a covey of partridges. And when he sent us the birds in this fashion from his 45ft. tower we found that, in spite of the gun being of a very bad bend for our use, we could get the three birds every time with the three barrels. But when the three birds were released absolutely together it was quite different; then we only got the three in front twice, and on one of these occasions two were broken with one barrel. Probably, however, what we can do once with a gun that does not fit, others can do frequently with a correct fit. There is no doubt that a gun that does not fit wastes much time in aligning. And this is all a question of time. We are

conscious that we cannot do the gun justice from our own experience of it, for we felt all the time we were shooting it that we could have done very much better with a proper fit. This did not matter much when the birds came in strings, because we were then able to get them before they got to side angles ; and at these angles we can safely say that we did not know where we were shooting within yards. We trust we may have an opportunity of seeing the gun shot by someone whom it does fit, for we are convinced there are records to be made out of it.

As to the mechanism of the single-trigger action we have very little to report. It is made on the now well-known Boss principle of a revolving pivot, and in the 200 shots fired by us from ordinary and small charges we had no accident whatever. It works truly and accurately, and must be regarded as a mechanical triumph. We must not forget to say that it has indicators to show which of the barrels have been fired. The three barrels are laid side by side, and there is nothing clumsy or unsightly about the gun, as might be supposed, and this 16-bore weighs under 7 lbs. For a driving gun this weight is not a disadvantage. It is becoming to be generally admitted that recoil is the great deterrent to quickness of the second barrel in shooting. In this respect the single triggers have a great advantage, as there is no letting go of the grip during recoil, and recovery from the jump is much quicker than where the right hand has to release or loosen its hold. For the same reason a heavy gun shooting a light charge has a distinct advantage in quickness, as the jump is much less. We think, though, that when shots are few and far between, lightness has its advantages, and we should not prefer to carry a heavy gun when walking to a brace of high-ranging setters in a country where game had to be hunted for.

There are moors on which we have had to beat 1,000 acres before falling in with a brood of grouse, and on such places the lightness of the gun is a distinct advantage, and the occasional kick from a light gun when birds are at last found is of no consequence as compared with the absence of weight.

We need hardly say that the three-barrel is not intended for similar work to that alluded to above, and the whole intention of its inventor is for the more effectual dealing with driven game before turning round or changing guns. We do not think with the late Lord Suffolk that repeaters will ever come in, although automatic loading guns may, some day, because of their absence of felt recoil, but at present the three-barrel single-trigger is the greatest advance that has been made in practical fowling-pieces.

We say practical because it has already attracted the attention and the approval of some of the best-known of the great grouse drivers, who have, we believe, greatly exceeded in number the 200 shots we have fired from it.

A SELECTIVE SINGLE-TRIGGER GUN.

Another improvement that we have been called upon to try by Messrs. Boss, of St. James's Street, is a gun having a stud whereby their usual single-trigger gun is made selective. Many attempts have been made to get a good selective single-trigger gun. The faults of some of them have been that when the stud has been moved so as to fire the left barrel first, the gun had to be opened before the right barrel could be discharged. The present invention has not this fault. The stud when pushed forward remains where it is put, and then the gun goes on firing left-right as often as it is loaded and until the stud is pressed back again, where it remains, and if left alone the gun fires right-left constantly. Messrs. Boss inform us that they can put the stud anywhere in the neighbourhood of the handle, so that the shooter can change his mind effectually even as he raises the gun to the shoulder and while the finger is in search of the trigger.

A good many people think that a selective single-trigger will be an advantage, and we have heard some shooters declare that they would not have a single-trigger because of the inability to select the barrel to be discharged. Of course, it is well recognised that those who load their barrels variously with different loads as for snipe and duck would not be properly armed with a non-selective single-trigger, but for

grouse and partridge driving and for covert shooting the old idea of a cylinder in one barrel and a modified choke in the other has not prevented a large number of single-triggers finding the approval of shooters. However, this new



SLIDE OF DOUBLE-BARREL SINGLE-TRIGGER SET FOR RIGHT-LEFT.

selective action disposes of the most pertinent argument that has been urged against the single-trigger system.

We may say that we have given the gun a good trial, and found no hitch whatever in the mechanism, either by examination of the works or by shooting the gun.



SET OF DOUBLE-BARREL SINGLE-TRIGGER SET FOR LEFT-RIGHT.

Both these guns are fitted with the Boss ejector, which has the advantage of extracting the unfired cartridge to the full length of the opening of the gun, as well as ejecting the fired shell.

CHAPTER XXIII.

MR. E. J. CHURCHILL.

MR. CHURCHILL first forced himself upon our notice about four years ago, when we undertook an analysis of the value of pigeon shooting as a guide to gun and powder maker. Time after time Mr. Churchill headed the list of the weekly analytical tables. At that time very few of the pigeon shooters were using Mr. Churchill's guns. And the weekly scores had been left alone to tell their own story we do not think many people would have taken the trouble to enquire how any gunmaker's percentage of wins stood in reference to his number of chances. At that time, for instance, Reilly's guns had very nearly double the chance to win that Churchill's had. Take for instance the table showing the results of the 1894 shooting:—

PIGEON SHOOTING RESULTS IN 1894.

Name of Gunmaker.	Number of Chances.	Wins.	Divided Counts Half.	Proportion of Wins to Chances.
Guyot.....	14	2	—	·14
Powell	201	16	18	·12
Ducasse	25	2	1	·10
Reilly	432	28	18	·08
Lang	74	2	7	·07
Churchill	248	15	7	·07
Atkin	119	5	5	·06
Purdey	1161	48	35	·05
Holland	106	4	4	·05
Chapu	23	1	—	·04
Parker.....	25	—	2	·04
Greener	82	2	3	·04
Rennette	27	1	—	·03
Bonehill	16	—	1	·03
Bodson	44	1	1	·03
Grant	53	1	—	·01
Westley Richards	1	—	—	—
Horsley	1	—	—	—
Evans	2	—	—	—
Boswell	3	—	—	—
Leeson	5	—	—	—
Baker	7	—	—	—
Criick	7	—	—	—
Lancaster	8	—	—	—
Cogswell and Harrison	8	—	—	—
Boss	9	—	—	—
Dougall	9	—	—	—
Janson	10	—	—	—

It also be seen that shot for shot Reilly stood higher than Churchill. In 1895, however, although Reilly was still using any more of his guns used than Churchill was, yet the proportions of wins to chances had been reversed. Reilly was also at that time having more than four times as many chances to win as Churchill was, but, nevertheless, the proportions of wins to losses stood even between these two makers in 1895. It will be observed by a comparison between the 1894 and 1895 tables that every one who headed Mr. Churchill in the earlier year was beaten in the latter, whereas he had improved his place. Following were the results for 1895 up to July 12, of those of the International Meeting:—

Gunmaker.	Number of Chances.	Wins.	Divided Counts Half.	Proportion of Wins to Chances.
Harris	4	1	1	.37
.....	9	1	2	.20
.....	6	1		.16
.....	3		1	.16
.....	244	11	23	.09
.....	111	4	13	.09
.....	640	38	40	.09
.....	30	1	3	.08
.....	53	7	10	.08
.....	53	2	5	.08
.....	6		1	.08
.....	26		4	.07
Ossey	178	7	14	.07
.....	169	6	10	.06
.....	44	1	4	.06
.....	377	11	21	.05
.....	98	2	7	.05
.....	16		1	.03
.....	17		1	.03
.....	68	1	2	.03
.....	2			
.....	2			
.....	2			
.....	2			
.....	3			
.....	6			
.....	8			
.....	9			
.....	9			
.....	12			
.....	21			

Result of this was natural.

Now it will be observed that the number of chances to win that his guns get is almost as great as those of Mr. Purdey's, and greatly in excess of any other maker's guns. Mr. Churchill has been the coming gunmaker at pigeon shooting for three years, and now it can be said that he has come.

TOTALS FOR THE FOUR WEEKS ENDING JUNE 26, 1897.

Name.	Chances.	Wins (Divided Counts Half).	Proportion of Chances to Wins.
Cogswell and Harrison	3	$\frac{1}{2}$	6 to 1
Greener	38	5 $\frac{1}{2}$	7 $\frac{1}{5}$ to 1
Bodson	18	2	9 to 1
Powell	46	4 $\frac{1}{2}$	10 $\frac{2}{5}$ to 1
Lang	6	$\frac{1}{2}$	12 to 1
Leeson	15	1	15 to 1
Blanchard	16	1	16 to 1
Churchill	204	11	18 $\frac{6}{11}$ to 1
Lang and Hussey	47	2	18 $\frac{4}{5}$ to 1
Purdey	239	12 $\frac{1}{2}$	19 $\frac{3}{5}$ to 1
Atkin	67	3	22 $\frac{1}{3}$ to 1
Woodward	32	1	32 to 1
Holland	36	1	36 to 1
Lancaster	30	$\frac{1}{2}$	60 to 1
Reilly	40	$\frac{1}{5}$	80 to 1
Boss	70	$\frac{1}{2}$	140 to 1
Beesley	2	0	2 to 0
Westley Richards	1	0	1 to 0
Guyot	5	0	5 to 0
Evans	5	0	5 to 0
Dougall	11	0	11 to 0
Grant	3	0	3 to 0
Ebrall	1	0	1 to 0
Baker	1	0	1 to 0
Braddell	1	0	1 to 0

We are not quite sure that our system of analysis was altogether the right one. As one maker said to us when we first proposed it: "This will give a wrong impression: I shall have a lot of guns shooting against each other, and if I win, and I can do no more, my proportion of wins will and always must be bad." To this we made the obvious answer that the more guns he had in an event the more chances he had to win. Now both of these remarks are

absolutely true, although they are seeming contradictions. Let us put it this way. Say that a gunmaker has ten guns shooting in a sweepstake. It is obvious that if one of them wins he cannot be better off than a proportion of ten chances to one win, whereas someone is certain to do better than that with a single entry upon occasion, and if his valour is tempered with discretion, and he acts on the principle of "he that fights and runs away," it is obvious that the maker who has many guns in an event can never make a very high



MR. E. J. CHURCHILL.

percentage of wins to chances. Doubtless if the French crack shot at pigeons had stuck to the French maker all through the piece, and no other shooter had shot with his guns, he would have stood at the top of the pigeon advertisement record, unassailable by anyone who had a single worse shot than M. Journu using his guns. Now that Mr. Churchill supplies a great many more pigeon shots than he did in 1895, his percentage of wins to chances is very much less than it was. At the same time he maintains

an excellent position when the lucky accidents of makers whose risks or chances have been very few are eliminated.

What has been the cause of Mr. Churchill's rapid advance in popularity? To put it shortly, we have no hesitation in saying because he deserves it. He is a first-rate shot and a mechanic besides. His customers, when they compete at pigeon shoots, do wisely to place themselves unreservedly in his hands. Then they go down to his shooting ground at Eltham, in Kent, to practise. Situated close to the station and within easy reach of Charing Cross or Cannon Street, it overlooks the famous Eltham Golf Club, in one of the most beautiful districts near London—a place where you might believe London as far off as a busy man sometimes wishes it. Here is a club house or pavilion, and here everything is kept in apple-pie order. Mr. Churchill goes so far as to cultivate roses in the enclosure, but it is all for business, nevertheless, and no time is lost in getting to work at pigeons, clay birds, and the plates. Mr. Churchill, unfortunately, was unable to provide us with a gun from his stock exactly to fit, as nearly all his guns are built to order and to measure for his customers, and he does not keep a large stock of guns ready-made for sale. Nevertheless, we were just able to try a gun or two at the plates, and to see how they cut down the pigeons when they were held straight. Mr. Churchill attributes much of his success to the special attention he gives to the making of cartridges. Take, for instance, the £5 handicap sweepstakes shot on the first day of the International week in the Diamond Jubilee year, and we find no less than four shooters out of the first nineteen who were using Churchill's cartridges, although they were using other makers' guns. Shooting hard and shooting straight, without unduly heavy loads of shot, we found to be his ideal, and also that his work was up to the ideal.

Mr. Churchill does not believe in entering into competition with his customers. Both he and his son are first-rate shots, but they lay themselves out, not to defeat their customers, but to bring up their form. One method of practice that they are fond of giving, at the grounds, is to place them about ten yards in front of the clay bird trap

and throw birds over them about seven yards from the gun muzzle. It is sharp work, and is perhaps open to the charge of snap-shooting at known distances in front of the object. But we know of no form of clay bird shooting that requires the same accuracy of aim, or an equal ability to get the gun back far beyond the perpendicular shot. On one occasion, at least, we saw Mr. Churchill score at an angle of forty-five behind (without turning, of course), certainly a greater angle than we ever saw accomplished



MR. H. E. J. CHURCHILL.

before. It must be remembered, too, that in breaking clay saucers within seven or nine yards of the gun that the shot has not had time to open out, and that it would be almost as easy to hit them with a ball. Although we had succeeded in plating the guns that did not fit us, and in killing pigeons fairly well, we were clean out of it with this performance, and we are not sure whether, as near the trap as ten yards, we could do it with our own guns. However, Mr. Churchill did it twice out of three times, for although of strong build

he seems able to get the gun anywhere it is wanted in remarkably quick time.

Questioning this successful gunmaker about pigeon shooting, we ventured the remark that we thought "recovery" much quicker when a light charge of shot was used, and that the second barrel would necessarily be quicker got in. Mr. Churchill thinks it makes a difference of three yards at least, whether a game load or a pigeon load is used in the first barrel—a statement we were very glad to hear, because it coincides with our own views, that for smart shooting a quick recovery of "possession" of the gun is absolutely necessary. By "possession" we mean that recoil or jump precludes the second alignment for a certain space of time, and until this time has elapsed, the shooter is not really in possession of, or controlling, his gun. With a gunmaker who has had, and is having, so much success with his weapons at pigeon shooting it is hardly necessary to inquire whether he can fit his customers. Of course he possesses the try gun, and believes that he can fit a man quicker and better with than without it.

Mr. Churchill learnt his business at the old establishment of Jeffreys, of Plymouth. He then assisted Mr. Baker in Fleet Street and Cockspur Street for fourteen years. It is only seven years since he began the very flourishing business he has made at 8, Agar Street, Strand, where his son assists him, and he is as good a shot as his father, and a thorough worker at his business.

Since writing the above in 1897, Mr. Churchill has again had a most successful season at the various Gun Clubs.

CHAPTER XXIV.

MESSRS. COGSWELL AND HARRISON.

IN one sense Mr. Edgar Harrison has been a leader, in another a follower. A few years ago he perceived that the most wonderful accuracy in countless numbers of rifles could be insured by American machines. He also observed that—in a country where the rifle is as popular as the bicycle is with us, where, moreover, the man who can afford to pay a long price for his rifle may exist, but keeps his dollars in his pocket if he does, where also it is thought good to shoot, but bad to pay for the privilege—there exist cheap rifles and cheap revolvers, the first of which bear comparison for accurate shooting with the best in the world, and the latter for workmanship and finish with anything that can be produced in London. He learnt also that the actual cost of producing the most wonderful modern arm—the Mannlicher rifle—was just 32s., and he became aware that the reason why for all this was summed up in one word—“tools.” We suppose that most of our readers are aware that all guns and rifles are more or less machine made. That is to say, the iron of an action when it is put into the hands of a London workman has been more or less shaped to the ultimate form. American machinery would also do this, but it would go a step further and shape it, not only to one form, but also to one size. That is to say, to one size to within the $\frac{1}{1000}$ of an inch. This left the skilled workman who had to fit the parts very little to do. The fitting, in fact, was done for him, for each part was interchangeable. The rough filing of the skilled worker at the bench no longer existed, and the beautiful work of the Smith and Wesson revolver, and its sale price, proved that his supervision was better than his elbow-grease. Mr. Harrison determined to follow the

American lead, and introduce the best machinery and the most accurate tools that money could buy. Two or three years ago we were invited to inspect this new plant by which Mr. Harrison hoped to be able to turn out London guns at a price that would startle competition. "Do you hope, then, to do away with the London workmen, whom you London gunmakers are so proud of?" we asked. He did not, but he hoped to enable them to cover ten times the ground with their skill. It is the last cut of the file that requires the most judgment, and the last cut still remains. They are the previous rasps of the file that have been rendered useless where the new machinery is in use. The judgment of the skilled London workman is as valuable as ever to-day, but he can fit the parts of ten guns in the time that, before, it took him to fit the parts of one. "That surely enables guns to be sold cheaper?" we remark. It does. It enables Cogswell and Harrison to sell a sound London-made hammerless ejector gun for 15gs. That is not all, though, we are informed. Look, for instance, at that solid lump of metal. It is steel, and is to be turned into a solid body. To do that before these machines were set up would have been very costly—as different, in fact, as the working of Whitworth steel barrels is to the working of Damascus barrels. Steel takes more elbow-grease, and wears out more tools: but the machines make no difference, they charge the same, whatever the metal: and girls do the work, until each part leaves the machines, and is given over to skilled workmen to build up the gun. How is it that girls can do work like this, where each piece of metal is to be cut so accurately that $\frac{1}{1000}$ of an inch, one way or other, would upset the expert workman, and throw away the value of these expensive machines? It is simply because the machines cannot touch the metal until it is in them, and it will not go in the wrong way or into the wrong place. There are 400 different machine operations necessary to the making of a single gun. When they have been performed the skilled worker is called in. He collects the pieces and builds up the gun, but not before each part has been gauged in every possible way, and touched with the hand-tool as it may

require. Each part must fit its own gauge, or it is thrown aside as useless. The result of this is that when the various parts are brought together to build up the gun, everything fits so nearly that the skilled worker is employed on each for but a fraction of the usual time occupied.

There are a large and growing class of shooters who prefer to pay less than the price charged for first-quality guns. Messrs. Cogswell and Harrison charge 59gs. for their best gun, but they have met a want with a cheap gun, every part of which, except the tubes, is manufactured in Gillingham Street, close to Victoria Station. We do not mean to say that there are not plenty of London makers who will sell a gun at as low a price as Cogswell and Harrison, but the difference is that one will be the gunmaker's own make and the other will not. We will not venture an opinion as between Birmingham and London work. We know very well that there are first-rate of each, but we can certainly say that in order to ensure value for money in cheap guns, in order to ensure the best material even, it is necessary that wherever the gun is made it should be machine made up to the point that this firm make theirs. We are fully aware that machines and the gauged tools for them are very costly affairs, and that the interest for capital invested must be paid for by the gun purchaser. We also know that if only a few guns were turned out by the machines they would cost much more than hand labour would cost; but competition is now set by machines fully employed, so that where the question of cost is considered at all, the machines must win by giving value for money. In coming to this opinion, we have considered, not only the saving of cost of working the ordinary iron, but, the ease with which a good grade of steel is made to take the place of the softer metal at no more cost of labour.

There is another great point also: it is that all accidental deviation is avoided when machines and accurate gauges are used. Mr. Harrison gave us an instance of this. Some time ago he saw a new method of boring a ball-and-shot gun. The weapon in question shot a remarkable diagram, but others supposed to be similarly bored would not. Mr.

Harrison thereupon purchased the rights, and offered a high price for four more weapons to shoot equally well. These have still to be made; the method by which the first success was made could not be repeated. This is not wonderful when we say that the grooves are only $\frac{1}{5000}$ of an inch in depth. The outcome of these failures is a very costly machine, which turns out its barrels to shoot as well as the first, and this is because every succeeding barrel made is necessarily an absolute counterpart of the original model from which the machinery was gauged and designed. We give a fifty yards diagram showing what the makers are prepared to do, lent to us by the firm, but not made in our presence, by a ten-bore "Cosmos," for that is the name of the weapon, with its usual load of 8 drachms of powder and 850-grain bullet. It may be stated that this weapon gives a muzzle velocity of 1,550 f.s. It is made in 8, 10, and 12 bores. It has the Greener extension bolt, and the Anson and Deeley action.

Certainly, Mr. Harrison seems to us to have scored over the introduction, in London, of accurate gun-making machinery. After all it is nothing more nor less than what Government have done. The modern Enfield .303, with all its repeating machinery, is made on similar principles, and so is the Government revolver. The novelty is merely in the application of the principle to shot guns in London, and even that is only new in the degree to which it is carried.

Mr. Harrison has no love of the salesman's business. He leaves this part of the business to Mr. W. C. Langhelt at 141, New Bond Street, and to Mr. Gray in the Strand. These two between them manage to keep his great plant of machinery going, and it is here that you may always find him. Some new piece of machinery or some new tool has more charm for him than the finished article. He holds that perfection of machinery insures perfect parts of a gun, and that it is only when all the individual parts are perfect that a perfect whole is possible. Possibly the majority of the users of Cogswell and Harrison's guns have never seen the chief of the firm. Possibly they believe the whole business is left to the able managers they see in the two

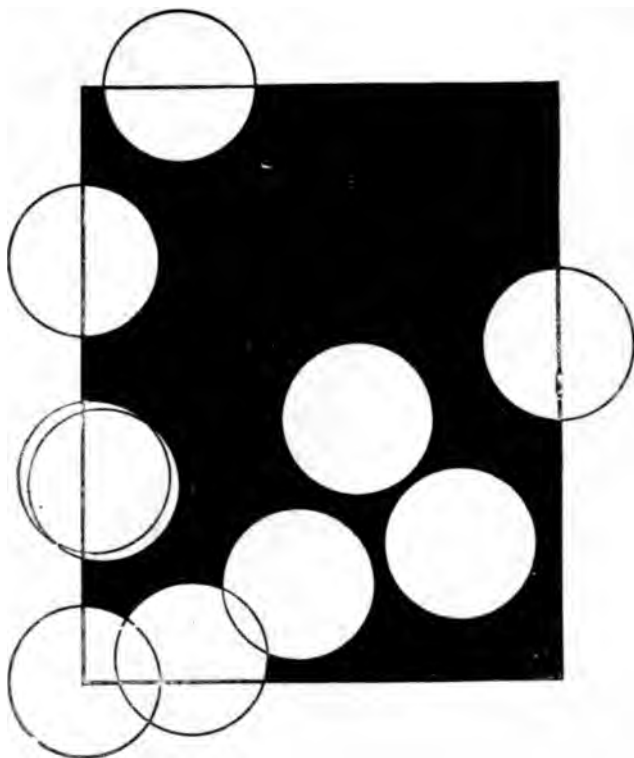
shops. But, as a matter of fact, no gunmaker in London sees more, or perhaps, as much, of his guns as Mr. Harrison does. He sees that each machine is turning out its work correctly, and when that is done he is of opinion that the finished article is within measurable distance, and can hardly go wrong. He carries his scientific investigations very far, for he tests his metals chemically as well as mechanically, and has a laboratory and chemist at the works for the former purpose.

We suspect that most gunmakers now take the pressures of each new batch of nitro-powder that comes in, but it was, we think, Mr. Harrison who first did this, and thereby built up an enormous business as a retailer of loaded cartridges at prices ranging from £3 15s. to £5 10s. a thousand. We are not even now sure that many gunmakers take the trouble, not only to test internal pressures of new batches of powders, but also to try velocities given by them. This Cogswell and Harrison do, and not only that, they test each new batch of primers also, so as to accommodate primers to powders or powders to primers, for it is well known that a slight variation in either makes a great difference to the manner of the combustion of the charge, and therefore also greatly affects not only pressures on the barrels and velocity of shot, but time between the pull of the trigger and the starting of the shot. This short variation of time may be of very little account when game is going straight away, but when the shooter is allowing yards before his game, it may, on the contrary, make all the difference between enough and too little.

Primers vary greatly; powders vary more. They do not only vary as between maker and maker, but as between batch and batch of the same maker. Here is at once the difficulty and the uselessness of trials of powders by the press. Newspapers cannot be going round and trying each different batch that comes out, and nobody is better aware than the powder-makers that nitro-powder will vary, whatever care is used in the making. The trial of each batch, and the retarding or accelerating of it by appropriate detonators, is the business of the gunmaker who sells

cartridges. Hold him responsible not only for too little power, but also for too much. No one can maintain a steady average of good shooting at quick-driven game whose cartridges vary very much. We think that ignition should always be the same, either quick, slow, or medium, but never first one and then the other. We grant that a difference affects the shooting of some men less than it does others. The man who goes with his game, and more, he who swings in front, will feel differences of ignition less than he who fires at an imaginary spot in front of the game, with little or no travel of the gun with the object. The smallest hangfire, even when the shooter was unconscious of it, would be enough to disturb the aim of the best shot by this latter method, we should say, if such exist, for we believe that the two methods of shooting blend one into the other, that good shots must do both to a certain extent, consciously or unconsciously, at fast-winged driven game. But there is no doubt that some lean to one method to a greater degree than the others. In rabbit-shooting, across rides and paths, no follow or swing is not practicable, as a rule, but then the pace of rabbits and that of winged game is very different. Let no sportsman think that the time the shot takes from the muzzle to the game varies to anything like the extent that the time of ignition varies. We do not think that variation of the velocity of the charge is likely to be great enough to affect the shooting of anyone; because the powder-makers take great care that their powders shall have killing power; but they have not got the control of the cap-makers, and it is the latter upon whom speed of ignition chiefly depends. It is the gunmaker on whom we must depend to keep these two up to the mark, and, if that be impossible, then he must regulate the ignition of the powder by the choice of a suitable detonator—to suit or neutralise the particular fault it may show. What we mean to imply is this, that every cartridge that leaves the gunmaker should (barring the effect of weather) behave exactly like those he sold the year before, and will sell the year after. Of course, we know that all the nitro-powders will be more or less affected by the weather—some very

greatly, others very little. The gunmaker cannot control the weather, but he can, and should, test his powders for variation with the weather, and discard those whose ignition is most delayed by damp. All this requires the chronograph to test, as well as the crusher-gauge, and these instruments Messrs. Cogswell and Harrison have long possessed, and



DIAGRAM, MADE AT 50 YARDS, with the "Cosmos" Ball-and-Shot Gun.

used upon every batch of powder delivered to them, a fact which has sometimes brought them into sharp collision with the powder-makers. Mr. Harrison is now making half-a-dozen of Smith's chronographs for various powder manufacturers.

This gun-making business was carried on in the last century under the name of Essex, a relation of the Cogswell whose name it now bears. It became Cogswell and Harrison about the year 1860, and was for long carried on two doors

away from the present shop in the Strand. In 1874 Mr. Harrison joined the business, in 1879 the Bond Street branch was opened. In 1887 he took entire control, owing to the death of his father. In 1882 the Harrow factory and range was opened, and in 1894 the large place in Gillingham Street was acquired, where there is the only shooting-range of a "practice" character in London (for the various shooting schools and practice grounds belonging to gun-makers are not as much in London as they are in the suburbs). Mr. Harrison was one of the first to take up clay-bird shooting in the hope of pushing it to an importance similar to that it holds in America. He confesses to a great deal of disappointment; and to say truth, clay birds are of more use to shooting schools than they are for the purpose of competitions. It is a target altogether unlike living game, inasmuch as it starts quicker than any living game, and too suddenly becomes slower. We think that it is generally agreed that some target with an accelerating pace, not a diminishing one, is necessary in order to popularise an imitation of sport with the gun.

CHAPTER XXV

GIBBS, OF BRISTOL

It is many years since we made the acquaintance of the founder of the Bristol gunmaking business. George Gibbs was a name known in every district in the west of England and in South Wales, for wherever there was sport to be had, Mr. George Gibbs was sure, sooner or later, to sample it. The Bodmin Moors, in Cornwall, were in his day noted for a good sprinkling of snipe, and this was one of Mr. Gibbs' favourite beats. He had his own private shooting also, but this did not satisfy a man who was never happy unless he was shooting, so that Ireland as well as Cornwall and South Wales were compelled to contribute.

Wimbledon, of course, knew him just as it knew, and Bisley knows, his son, who, we imagine, would by rifle shots be conceded the first place in the British Islands as a long range rifle shot.

This position G. C. Gibbs has gained by no single feat but by constant good shooting, varied only by occasional phenomenal feats.

In the Elcho Shield competition, for instance, Captain George C. Gibbs, of the 2nd Gloucestershire V.R.E., has shot in the English Eight every year since 1882. Of the three sons of the elder George Gibbs, who died in 1884, two are now in the business, and they divide the labours of gunmaking as well as the pleasures that it brings. Sport in a west country town like Bristol is a great social institution, and brings people together in a way that we know nothing of in London town. Sport in Bristol at one time of the year centres round W. G. Grace, at another round Gibbs and rifle shooting, who, with his brothers, takes great interest in almost every branch of sport, including cricket, and its

veteran exponent, the great W. G., whose jubilee fell in 1898. Mr. G. C. Gibbs is as fond of hunting as he is of shooting, and it was he who originated and hunted the now celebrated Clifton Foot Beagles—a pack which has shown such wonderfully good sport during the past few seasons. How much of Dr. W. G. Grace's wonderfully prolonged form can be accounted for by his constant attendance on these beagles



MR. G. C. GIBBS.

is not for us to say, but that they hunted twice a week, and never, or hardly ever, without W. G., is certain.

These are by no means all the reasons why West of England men swear by Gibbs, and many another sportsman besides thinks there is no gunmaker to be found, even in London, who is his equal. The present George Gibbs had a very particular education in gunmaking. It is well known, of

course, that Mr. Metford, the father of the match rifle as well as our present army weapon, was a west countryman, and it is to his able tuition Mr. Gibbs owes much of his success as a rifle-maker and shot. Indeed, some of the tools or gauges with which a Gibbs gun is made to-day were actually the workmanship of that most celebrated of modern rifle experts and mechanics—Mr. Metford. Mr. Gibbs also received valuable help from the late Sir Henry Halford, who devoted so much time to the perfecting of the rifle, and it was at Wistow, in the presence of its late owner, that Mr. Gibbs made his great record target.

Of this extraordinary performance it may be well to quote a fellow-member of the English eight. The Hon. T. F. Freemantle says in his Notes on the rifle :—

“Without entering into the subject of the large scores which at one time and another have been made at long ranges, it may be well to give examples of what is the best work that under the most favourable circumstances can be got from rifles at 1,000 yards. The first target given has appeared in print before, and it is beyond doubt the best piece of shooting at 1,000 yards that has ever been made in this country. There seems no reason to believe that it was ever equalled by any performance in America. To put forty-eight out of fifty consecutive shots into the 3-foot bullseye is a feat which combines a very high degree of skill with some good fortune. The bullseye on Sir Henry Halford's range consists of a steel plate hung in front of the target. It has had many thousands of shots fired at it at 1,000 yards, during a period now of more than thirty years, but only on this one occasion has it responded with its musical sound thirty-seven times running. The weather was very favourable—there was only a slight drift of wind—the light being steady and not too bright. A bright glare is apt to tire the eye in a long series of shots, and a rather dull—even slightly hazy—light is the best. The strain on the attention, and the anxiety to fire every shot perfectly, make it a great effort to fire a long string of shots, especially when the winning of a match or the cutting of a record depends upon each pull of the trigger. Captain Gibbs is one of the men whose self-command in such circumstances is entirely to be relied on. It is noteworthy that the rifle with which this target was made was an old one, and had previously had some 20,000 shots fired from it. It was not cleaned during the shooting.”

Mr. Herbert Gibbs (who is more often found at the

Corn Street premises looking after the "business" arrangements of the firm than at the works) prefers the shot-gun to the rifle, and when we saw him last in Bristol he had lately been participating in one of those extraordinary goose drives that can be had at only one place in England, viz Berkeley Castle. As makers of shot-guns the name of Gibbs has for half a century had a firm hold on the mind



MR. HERBERT GIBBS.

of West of England shooters. Our own experience of the dates back to over a quarter of a century. It was, in fact, with a Gibbs gun that we compared the first choke bore ever made in this country. It was a good gun—so good, in fact, that Mr. Greener remembered it perfectly well after lapse of twenty-three years, and startled us by asserting that it was the best cylinder gun he had ever seen. Its average

pattern at the 30-inch circle forty yards away, and with $1\frac{1}{4}$ oz. of No. 6, was only 130, so that it is easy for young sportsmen to decide whether the invention of choke-boring was as useless to sportsmen as most sportsmen and some gunmakers are in the habit of declaring. We are quite sure of this, that at least nine-tenths of the game guns used in this country have more or less choke in them.

It used to be thought that the man who had the best workmen made the best guns. There is, perhaps, a very great deal in that even yet, but to a far less extent than used to be. The best guns nowadays are far more a question of tools—design, tools, and gauges, and workmen combined. It is therefore the man who knows the best design when he sees it, and can make tools to automatically reproduce it, that succeeds best as a gunmaker to-day. The reasons of this are not far to seek. A hammerless ejector gun is a much more complicated arrangement than the old central fire was, and it no longer pays to attempt to build a gun by rule of thumb; that was an artistic feat accomplished only by the best of workmen in the old days. Now, however, the master has made the gauges and the workman files as long as he can reach the metal, and is prevented from taking too much off or too little. It follows that every piece is bound to fit, for each has exactly the same convex or concave curve, exactly the same thickness of metal, and exactly the same weight, for the quality of the metal employed is always the same—the best. The gunmaker's plant consists now of dozens of little boxes, each containing all the necessary gauges to make a single bolt or bar or spring. These are the tools or gauges that represent fine finish to the complete gun. They do not look much, these lumps of steel with a notch here and a slot there, but each one of them probably represents ten or a dozen measurements, each accurate to the one-thousandth of an inch, each with its convex curve corresponding to the concave curve in another, even to a similar degree of closeness. What is the use of it all? Well, in the old days they used to bore the extractor holes after the barrels were put together, and sometimes they would pierce the

barrel in such a way as to make it dangerous. We have at this moment a gun that has been condemned as dangerous on those grounds. Now they make the lump first and pierce the extractor hole in it too, and all by gauge, so that the hole cannot bear up or down, to the right nor the left, according to the hand of the workman who directs it. The tool holds the piece and directs the cutter or "bit"; all the workman has to do is to apply the power. This production of models, gauges, and tools has been a long work, always under the direction of Mr. Gibbs. We do not think that there could be a man more suitable for such an undertaking than the possessor of the eyes and hands that rifled the barrel of every weapon that shot in the English, Irish, and Scotch eights in the year 1890. That is a triumph of mechanical skill that Gibbs is not a little proud of. The reason he took personally to barrel-rifling was of a compulsory nature. His barrel-rifler declined to do some work required of him, and this difference of opinion left Gibbs with plenty of barrels, but no one to rifle them. He spent, he tells us, about three weeks in doing nothing else, and then discovered that he could do the work as well, or better than the man who had been at it all his life. When questioned as to the best manner of sighting sporting rifles, Mr. Gibbs strongly expressed his opinion in favour of taking the whole of the front sight bead when aiming, and having the sighting so regulated that the spot required to be hit should be in alignment with the *top* of the front-sight—his chief reason for preferring this plan of sighting is that accurate aim can be taken even at the smallest animals, which cannot be done if the spot to be hit is covered by the *centre* of the bead—particularly so at long ranges—for instance, in sporting rifles when the front sight is not more than three feet from the eye of the firer, a bead of ordinary size, say .06, will cover a diameter of no less than six inches at 100 yards, twelve inches at 200 yards, eighteen inches at 300 yards, and so on in like proportion.

In modern small-bore rifles with their extremely flat trajectory, it is the custom of some sportsmen to have but one backsight, and to make the necessary allowance

for the drop of the bullet either by varying the amount of the front sight taken, or by aiming high or low as the case may be.

While on this point we think that if a rifle has only the one backsight, it would be better for that sight to be regulated for 200 yards rather than 100, for by reference to the third table given below, we find that shooting with a .300 bore rifle with its 100-yards sight up at a beast 200 yards away, the bullet would strike 11·5 inches low, whereas, if the beast were but 100 yards off, and we had the 200 yards sight up, the bullet would strike but 5·75 inches high. This is a most material difference.

ANGLES OF ELEVATION FOR .303 AND .256 BORE SPORTING RIFLES
(compiled by Mr. Gibbs from results obtained at the range with several rifles upon different days).

Length of barrel, 25 ins. ;
weight of bullet, 200 grs. ;
M.V., 1950 f.s. ; energy at
muzzle, 1,687 f.p.

.303 Bore.	
Range.	Angle.
100	4'·75
200	10'·5
300	17'·25
400	25'
500	33'·75

Length of barrel, 25 ins. ;
weight of bullet, 156 grs. ;
M.V., 2,350 f.s. ; energy at
muzzle, 1,911 f.p.

.256 Bore.	
Range.	Angle.
100	3'·5
200	7'·75
300	12'·75
400	18'·5
500	25'

TABLES SHOWING POSITION OF BULLET IN RELATION TO SIGHT LINE.
.303 Bore.

Sighting used.		Distance from Muzzle in Yards.				
Yards.	100	200	300	400	500	
	inches.	inches.	inches.	inches.	inches.	
100.....	0	— 11·5	— 37·5	— 81	— 145	
200.....	+ 5·75	0	— 20·25	— 58	— 116·25	
300.....	+ 12·5	+ 13·5	0	— 31	— 82·5	
400.....	+ 20·25	+ 29	+ 23·25	0	— 43·75	
500.....	+ 29	+ 46·5	+ 49·5	+ 35	0	

·256 Bore.

Sighting used.	Distance from Muzzle in Yards.				
Yards.	100	200	300	400	500
	inches.	inches.	inches.	inches.	inches.
100.....	0	— 8·5	— 27·75	— 60	— 107·5
200.....	+ 4·25	0	— 15	— 43	— 86·25
300.....	+ 9·25	+ 10	0	— 23	— 61·25
400.....	+ 15	+ 21·5	+ 17·25	0	— 32·5
500.....	+ 21·5	+ 34·5	+ 36·75	+ 26	0

The + sign denotes above, while the — signifies below the sight line. The difference between the zero of sight line and the centre of bore line (it being a constant) is ignored.

Position of bullet at half distance (which is practically the highest point of the trajectory) in relation to sight line. It is assumed that the correct angle of elevation be used at the various distances, and that the apex of the front sight from which the line of sight is extended be ·75 in. above the centre of bore.

·303	{	In flight of 100 yards	= + ·5 in.
		“ 200 “	= + 5 in.
		“ 300 “	= + 13·875 in.
		“ 400 “	= + 28·25 in.
		“ 500 “	= + 49·25 in.
·256	{	In flight of 100 yards	= + ·2 in.
		“ 200 “	= + 3·5 in.
		“ 300 “	= + 10·125 in.
		“ 400 “	= + 20·75 in.
		“ 500 “	= + 36·75 in.

The following is probably the finest five-shot diagram at 100 yards ever made. It was made by the Mannlicher sporting rifle, to which the above tables apply, and the shooting was done by Mr. St. George Littledale from the back position, and with no artificial rest. Moreover, the rifle was a borrowed one, and these were almost the first shots Mr. Littledale had out of it. Still it is not fair to compare this wonderful target with those made in public or press trials, when one try alone is permitted, and the maker of the rifle stands or falls by the results. We feel very safe in saying that if Mr. Littledale had had 1,000 tries he could

not have improved on this target, and probably it will remain the record for years.

Messrs. George Gibbs are the agents for these wonderful rifles. Those of the sporting pattern being made up, fitted with sights, shot and regulated at the works and range in Bristol. As is well known they shoot a steel-enveloped bullet. This is the last of a long series of introductions by this firm since it began business, as J. and G. Gibbs, at 4, Redcliffe Street, in 1835. It became exclusively the

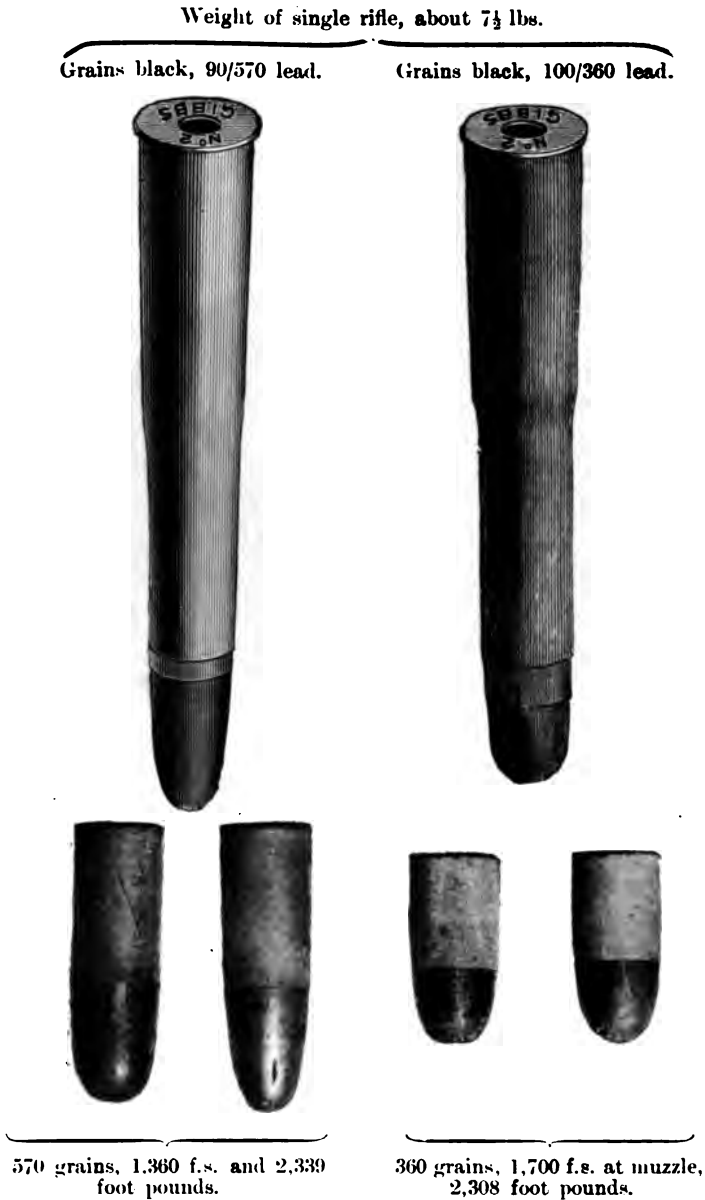


Facsimile of Target made by Mr. G. S. Littledale, April, 1897, with .256 Mannlicher Sporting Rifle, B1933, by George Gibbs, 5 shots at 100 yards, Lyman sight. Back position, rifle resting on knee. Original target in possession of Mr. C. B. Greenfield, the owner of the rifle.

business of George Gibbs in 1842, first at 142, Thomas Street, then at Clare Street, and finally at 39, Corn Street. The factory was built in 1873, and George Gibbs, sen., died in 1884. The well-known Gibbs and Pitt patent came out in 1873, and about 10,000 guns of this kind were built, a fact which speaks to the popularity and the merit of the makers.

In 1865 the firm acquired the sole right of boring Metford rifles, and they held this for fourteen years. In

1870 the Farquharson action was added, and henceforth the match rifle '461 was always made by the firm with this



combination. A sporting rifle very similar to the match rifle, except in length, is made and extensively used, more

particularly by South African sportsmen, and is much appreciated by our old correspondent, Mr. F. Kirby, who will not have the small bores at any price. Mr. Selous, the pioneer of Matabeleland, has most of his rifles from Gibbs, and Sir Samuel Baker obtained his first rifle, as well as one of his last, possibly not absolutely the last, from them.

The following copy of letter from Sir Samuel Baker is interesting :—

August 30th, 1887.

"About forty-six years ago your firm made for me the first rifle that I ever planned.

"This was entirely my own idea at a time when rifle shooting was but little understood. I was only twenty years of age, but having taken a peculiar interest in the subject, I was sure that a heavy charge of powder was the first necessity to procure a high velocity, and consequently a low trajectory.

"Your firm made for me a rifle weighing 22 lbs. to carry a two-groove belted ball of 3 ozs., with a charge of 1 oz. (16 drams) of powder. This was the first heavy rifle that ever was introduced to Ceylon, and it is referred to in my first work, 'The Rifle and Hound in Ceylon,' as a very wonderful weapon.

"The rifle was made according to drawings submitted by myself.

"As you made the first large bore that I ever had, which was most successful, I have no doubt that you would achieve a like success with the small-bore high express—125 grains of powder.—Yours faithfully,

"(Signed) SAMUEL BAKER.

"To Mr. George Gibbs, Bristol."

Mannlicher 256.—Weight of single sporting rifle, about 7 lbs.; double rifle, about 9 lbs. Weight of single with Gibbs-Farquharson action, about 6½ lbs.



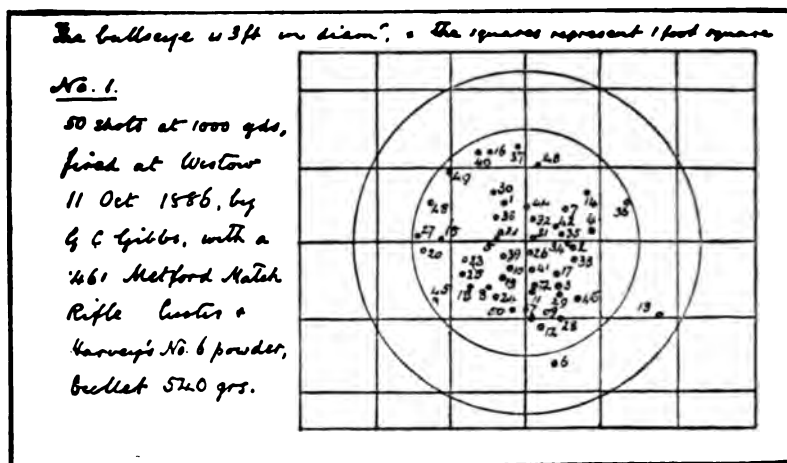
See table for weights, velocities, and energies of bullets.

Talking of curious rifles, there is kept at Bristol one of the four rifles that found the 2,000 yards target in 1866, when this competition was attempted at Wimbledon. The only four competitors who found the target used Metford rifles by Gibbs.

More extraordinary is the history of a rifle belonging to Major Frank Johnson, who writes :—

“The rifle is the one you sent Mr. Borrow in 1888, and which I at once took over from him. It has had some very rough usage (including three months at the bottom of the Pungwe), but I would not exchange it for the best rifle you could make.

“On the Pungwe last month I bagged with it in two and a half hours one sable antelope, three wild boars, two lions, and two buffaloes.”



Mr. F. C. Selous writes, March 16, 1894 :—“I have used none other than your excellent rifles during the last twelve years in Africa.” And in “Travel and Adventure in Africa,” page 430, he says :—“You can kill anything that walks the earth with a 450 bore Metford rifle by Gibbs, of Bristol. Having used Gibbs-Metford rifles for the last twelve years with the most complete satisfaction to myself, I naturally swear by Gibbs.”

Mr. F. V. Kirby (“Maquaquamba”) in “Haunts of Wild Game,” page 522, says, “I can testify to the capabilities of two rifles—the Gibbs-Metford (461 bore) Nos. 1 and 2. The latter is the most destructive and efficient weapon I

have ever seen in my life, and Mr. Selous has very clearly demonstrated what can be done with these Metford rifles upon elephants and other big game.

"With a Gibbs-Metford I have obtained most surprising results . . . the good qualities are in the rifle: with it I have killed a large bull elephant with a single shot, and several rhino. with one bullet. On one occasion I dropped a big rhino. bull in his tracks with both shoulders smashed."

Page 527: "Such a weapon is the Gibbs-Metford, which will at once commend itself to all practical sportsmen.

'A 461 bore Metford is perhaps as perfect a weapon for lion shooting as one can desire."

At the Bisley Rifle Meeting, 1895, 1896, and 1897, the first prizes in all the competitions for sporting rifles at the running deer and running man were won with rifles manufactured by George Gibbs.

A RECORD AT BISLEY.

1895.

"The Colt"—Running Deer.

Earl Cairns, 21 Gibbs 303 single

"The Hillhouse"—Running Man.

Earl Cairns, 21 Gibbs 303 single.

"The Dan Fraser."

Earl Cairns, 27 Gibbs 303 double.

1896.

"The Jeffery"—Running Man.

(1) Lieut. Ranken, 21 ... Mannlicher 256, by Gibbs.

(2) Earl Cairns, 21 Gibbs 303.

"The Gibbs"—Running Deer.

(1) Earl Cairns, 15 Gibbs 303.

(2) Lieut. Ranken, 15 ... Mannlicher 256, by Gibbs.

"The Henry"—Running Deer.

Earl Cairns, 27 Gibbs 303.

"The Colt"—Running Deer.

Earl Cairns, 22 Gibbs 303.

1897.

"The Henry"—Running Deer.

Earl Cairns, 27 ... Gibbs 303 double.

"The Gibbs"—Running Deer.

(1) Earl Cairns, 15 ... 256, by Gibbs.

(2) Lieut. Ranken, 15 ... Mannlicher 256, by Gibbs.

"The Colt"—Running Deer.

(1) Earl Cairns, 22 ... 256, by Gibbs.

(2) Lieut. C. G. Nix, 22 ... Mannlicher 256, by Gibbs.

"The Jeffery"—Running Man.

Lieut. Ranken, 21 ... Mannlicher 256, by Gibbs.

Gibbs' rifles also took the Colt and the Gibbs in 1898 and 1899.

CHAPTER XXVI.

MR. STEPHEN GRANT.

It is twenty-four years ago when we first came into contact with the late Mr. Stephen Grant, and as this was of the nature of a skirmish between two well-known men, one that did credit to both of them, we will relate the circumstance.



THE LATE MR. STEPHEN GRANT.

In the year 1874 Mr. Greener brought to public notice his choke-bores, and it happened at that time that we were shooting a few miles north of Birmingham. We called the attention of Mr. Smirthwait, the then editor of *Bell's Life*, to the extraordinary shooting of guns bored on this principle ; and he, in reply, asked us to write for *Bell's Life* full reports

of this revolution in gunnery. This we did, and Mr. Stephen Grant, who had hitherto been a regular advertiser of guns in *Bell's Life*, wrote to that paper to say that if these reports continued he must withdraw his advertisement. They did continue, to the credit of *Bell's Life*, and the advertisement was accordingly withdrawn.

We do not think anybody thought any the worse of the late Mr. Stephen Grant for being doubtful as to the accuracy of records that more than doubled the pattern usually given by shot guns, nor for expressing his disapproval in the only way at his command. However, it so happened that by the accident of regulating guns upon the shooting ground some of Mr. Grant's own make happened to be very mild choke-bores, so that when they were entered in the trial between choke-bores and cylinders at the Gun Club they were disqualified upon measurement for the latter class. Nevertheless, all this was then accomplished by the accident of the boring in regulating, and when a gun shot particularly well—that is to say put 130 No. 6 shot into the 30-inch circle, forty yards away—it could not be repeated in the next gun made. The contraction of the muzzle might be there, but it was not known that this was the cause of the good shooting. Mr. Stephen Grant lived to take as much advantage from the choke-bore as anybody, and at the time of his death nearly every gun he turned out was choked in one or both barrels. Generally in one only, for Mr. Grant and most of his customers believed in the advantages of a difference between the right and left barrels. The value of this difference has been greatly run down of late by some people, but the firm of Stephen Grant number some of the best shots in the world amongst their customers, and they are just those who can appreciate the difference by using the right barrel at the right time. That is not what everybody can do.

The late Mr. Grant started the business in 1867, and he died January 21, 1898. By his death we lose an artist in gunnery, and one of the keenest observers upon all shooting matters. But we will quote from an article that appeared in *Land and Water* ten years ago.

"The firm of Grant is unquestionably one of the very oldest at present existing of the original London gun trade, Mr. Grant having been in partnership with Mrs. Boss, after the death of her husband, Thos. Boss. At the expiration of his partnership with Mrs. Boss, Mr. S. Grant started in business on his own account, and is to be found at 67A, St. James's Street. To lovers of the trigger, and to those who are desirous to see what London can produce in the way of the highest class gun manufacture, a visit to the above address will be of great interest; and if Mr. Grant should have time to 'personally conduct' the visitor over his establishment, the pleasure will be doubly enhanced by the *bonhomie* of his jolly presence, and his hearty love of a good all-round sportsman and for sport in its various phases; and if the pleasant chat on guns and shooting should be interrupted by individuals dropping in now and again with a word for Mr. Grant's private ear, in reference to 'the odds,' why, 'what's the odds,' and we mean to gratify no curiosity except in relation to guns and their equipments at 67A, St. James's Street. The world has used Mr. Grant well, and he appreciates her kind attentions, as is evidenced by the comfortable appearance of his portly figure and the merry twinkle in his eye; nevertheless, he will come forward simply in his shirt-sleeves and working apron to greet any who should chance to call."

But it must not be supposed that the apron is a sure indication of the gunmaker, for there are in the trade those who wear it who are not educated as bench gunmakers, as well as those who do not wear it who have served their proper apprenticeship.

"In our conversation with Mr. Grant we have been impressed by the fair and candid way in which he has judged the work of others, giving full praise where it was due, and, indeed, taking a more modest estimate of his own performances than they rightly deserve. On the various questions also relating to the details of gunnery he will be found far more liberal and less bigoted than the majority, and his attitude on such matters might be defined as that of broad common sense. What will be best for the sportsman is the point which he keeps the most prominently in the foreground, all beyond being held by him to be mere fancy and opinion. He is not in favour of the excessively light guns which seem to be quite a craze in some quarters, and since his patrons are men of the first flight in the shooting world as game preservers and shots, and who work their guns hard during a great portion of the year, no information can be more important than his declaration that the best and hardest shots amongst his customers have no opinion of these over-light 12-bores. Mr. Grant considers

6½lbs. to be the proper weight of a solidly-made serviceable 12-bore gun, fit for hard work, in the hands of such shots as Lord de Grey or Lord Walsingham, who give a gun such work as would soon knock to pieces any but the soundest. For such a gun he would consent to work no lighter than 6½lbs. at lightest, *i.e.*, with barrels of ordinary length, viz., 30in. Being pressed hard by us to name a less weight, he stated that, if the barrels were cut down to 28in., and the rib left out, he would make a 12 of 6lbs., but below that weight he positively refused to go; and asserted, in addition, that he never would go as low willingly, as he much disliked such work."

That the light guns spoken of in the above have now almost entirely disappeared bears out in a remarkable manner the late Mr. Grant's views. We do not, however, think that it was the alteration in the proof of guns that killed the feather-weight 12-bores, but that recoil was responsible for it. This extra recoil, by the way, has never, we believe, been detected by any of the instruments made for the purpose, and the reason of this is not far to seek, for the weight of the heavier guns recoiling at a slower pace adds to their measured energy or momentum as the absence of weight, in the light guns, deducts from theirs. Yet it is the pace of recoil that destroys the happiness of the shooter. The nearer the gun approaches to the weight and velocity of the projectile the worse for the shoulder, for the fingers, and, if the gun be badly fitted, for the cheek also.

"No. 12 bore, in his idea, ought to have barrels of less than 30in.: and, if he were required to make them as short as 28in., he would not consider them equal to others of 30in., but below 28in. nothing would induce him to go. As to barrels of 27in., or even 24in., which we hear of, he is decided that they cannot compete in the field with longer ones, whatever they may be on the target. Short barrels, he states, do not burn the powder, and are inferior to aim with. His words were: 'If you are a little out with a long barrel, you are more with a short one.' He pointed out, moreover, that the new proof, which came into force in April, 1888, is very severe, and that many who were at one time strongly favouring extra light guns are now rather weakening over them. If a very light gun is a necessity, he would recommend a 20-bore, which is far lighter than a 12, and yet can be made sound. On the subject of steel *v.* damascus, Mr. Grant is very clear, and much prefers damascus for hard-worked guns. In this connection he related an anecdote of one of his patrons, whose keeper stupidly put a 12-bore

cartridge into his master's gun without knowing that he had previously inserted a 20-case, which had stuffed up the barrel. Fortunately no burst occurred, but a big bulge, which, however, Mr. Grant hammered down, and the gun is now as good as ever."

This statement seems to imply that steel will not bulge, but that damascus will. This is a mistake. We have before us some scientific experiments of steel gun-barrels, that show steel capable of bulging, before a break occurs, to the extent of one inch in six, and others in which the stretch was 20 per cent. increase.

"For choke-boring he appears to entertain no strong predilections, and is of opinion that a cylinder barrel can be bored to serve the purpose of the game-shooting sportsman better than a choke-bore. When on the topic of the combined ball and shot guns, he asserted that there is nothing absolutely new in the idea, for there was a certain Irishman who hit upon it several years ago, and had a rifled muzzle made to fasten on to his gun. Is there anything new under the sun, though doubtless that luminary is the witness of many developments of crude germs of invention!"

This question of short barrels is better understood to-day than it was ten years ago, when the above was written. Since that time the firm of Grant have made one pair of 26-inch barrels; but it was a task forced upon them. Perhaps with the modern nitro-powders the question of the powder all burning in the short barrels has disappeared. We think that it has disappeared. We are not, any the more for that, disposed to doubt the accuracy of the rule of thumb that brought the late Stephen Grant to his decisive opinion against short barrels. Even if we grant that the powder is all consumed at 26 inches, we shall require more of it to supply the place of the unexhausted force of the gas that is let loose from the barrel four or six inches too soon. With this addition of powder we obtain more recoil, so that for a 12-bore shooting a 12-bore charge, there have been no new lines invented superior to the old. We again quote from the old report:—

"Having thus premised our remarks on the Grant guns, we will say, by way of description, that the first and chief impression one receives from them is that of admirable and perfect proportion. True

proportion and symmetry play a greater part in a successful day's shooting than some, perhaps, may imagine; and, together with exact balance, enables the gun to be brought up correctly to the proper place, even towards afternoon, and assists many a moderate shot to kill his game clean, whose natural form, if using a less perfect weapon, would be in the direction of 'tailoring.' The guns of Grant are, moreover, most perfectly and beautifully finished, and fitted, and turned out of hand. He used once to be somewhat in favour of back-action locks, which, in our opinion, rather detracted from the handsome appearance of the guns, though that is a matter of little consequence in comparison with utility and strength. His hammerless guns are, however, on the bar principle.

"The Grant gun is a beautiful little tool, beautifully proportioned, perfectly balanced, light, elegant, and handy, and that it can shoot and last, the fact of the large and influential connection of patrons for which the firm have worked for so many years, and who 'swear by Grant,' is ample guarantee.

"The name of Grant, as well as that of Boss, was for many years heard more frequently in the pigeon-shooting clubs than any other, but of late it has not been so. To send a representative to attend the shooting grounds time after time, whether the day be wet or fine, entails an outlay of no small proportions, as does also the payment to the daily papers for insertion of the notices of the guns used; therefore, the race has been left to those whose purses are long, and who find that such a system serves them for the advertisement of which they had need. Hence it is that certain good names have retired from the position which mere gunmaking ability alone would have continued to ensure to them."

The firm is now carried on by the late Mr. Grant's two sons, Stephen, the elder, who has for twenty-two years been in the business, and Herbert, the younger. Asked by us whether he thinks that gauging tools and machines will not in time eliminate the differences between country- and London-made guns, Mr. Stephen Grant places in our hands some of his latest productions—models of balance and handling—and he asks our opinion whether the same weight of action, such as is necessitated by the machine, and its gauge would suit any two of them. It is all a question of proportion, he says. As long as weights vary machine-made guns cannot be regarded as in true proportion except by accident. What is right for one weight must necessarily be wrong for another.

CHAPTER XXVII.

W. W. GREENER, BIRMINGHAM.

MR. W. W. GREENER, successful before the choke bore, became noted by his introduction of it. The history of the firm commences when the late William Greener (father of W. W. Greener) returned from London, where he had been working for John Manton, and established himself in 1829 at his native town of Newcastle, where he had been apprenticed to a gunmaker of the name of Gardner.

Almost immediately he commenced experimenting with the intention of publishing his first book, "The Gun," which appeared in 1835. This work dealt nearly exclusively with small arms, and it contains many ideas then new, with deductions from his numerous experiments supporting them. At this time there was scarcely a work on the subject of gunnery, with the exception of Baker's book on the rifle, even then out of date. This was followed six years later by "The Science of Gunnery," dedicated to Prince Albert, which, besides embodying "The Gun," dealt with cannon, and contained criticisms of other workers in the same field.

In November, 1844, finding himself much retarded by the difficulties of obtaining materials from Birmingham, W. Greener moved his business to that town, and there began to make greater progress. An enlarged edition of his second book was published in 1846, and in 1845 the pamphlet, "The Proof House, the Present Company the Bane of the Trade," was the chief means of promoting the Gun Proof Act of 1855.

We are informed that W. Greener was the first to discard vent holes in the breeches, relics of the old flint-lock gun. He was also instrumental in improving the hardness and quality of barrels, by introducing more steel into

their manufacture. He also improved the pattern of the harpoon gun, and his was the one adopted for the Scottish fisheries ; it is still to be found in use. But, undoubtedly, his greatest achievement in gunnery was the discovery of the expanding principle for muzzle-loading rifle bullets. The musket to which W. Greener adapted his bullet was eleven bore, and though the trial of this invention proved that the rifle could be loaded as easily as a smooth bore while still retaining its accuracy, no notice was taken of it by the Government, yet in 1852 the Government awarded Minié (a Frenchman) £20,000 for a bullet on the same principle as Greener's invention of 1836. The method used was that of a plug driven by the powder gas into the base of the bullet. Mr. Greener considered himself aggrieved by this, and the Government ultimately admitted the justice of his claim and gave him £1,000 in the Army Estimates of 1857.

W. Greener did not confine himself to gunnery, and among his numerous inventions were Davy lamps, a lifeboat, self-righting by means of water-ballast, and a mechanism by which four gates could be worked at once for level crossings. He also in 1847 patented an electric light system.

As a sporting gunmaker, W. Greener had now (1845-58) arrived at a very high position, proved by the fact that he was appointed to make guns for the Prince Consort, and at the 1851 Exhibition he received a highest award "for guns and barrels perfectly forged and finished," and later, too, at the New York and Paris Exhibitions of 1853 and 1855, silver medals were awarded him. In the palmy days of the Southern States of America before the war, very highly finished weapons were sent there, as much as £75 being paid for a gun of W. Greener's make. It was with the money obtained by the supply of South Africa with two-groove rifles that Mr. Greener erected his factory at "Rifle Hill," Aston, in 1859, and the more prosperous time of the firm may be dated therefrom. Just before this, W. Greener had published his last work, "Gunnery in 1858," which was written in the warlike spirit, as he challenged the statements of other authors very freely. Though he lived until 1869, he never took kindly to the breechloaders, and died in

the faith in which he had lived. His son differed from him in this respect, and struck out a line of his own in breech-loaders, producing in 1864 his first patent, an under-lever pin-fire half-cocker, with a top bolt entering the barrels underneath the top rib.

After the death of W. Greener the two businesses were amalgamated and carried on by W. W. Greener, whose next patent was the self-acting striker—a method only superseded by the rebounding lock. This was not of so much importance as the patent that followed it, the famous cross bolt, produced as a single-top bolt in 1865. In 1873 this was combined with the bottom holding down bolts to form “The Treble Wedge Fast,” one of the strongest breech actions ever invented, and one that has become much used of late, wherever an extended rib is thought to be necessary. Even London makers are now employing it to withstand the heavy charges in rifles of express character.

W. W. Greener having written five books, of which two have reached a sixth edition, has emulated his father in authorship. His first effort was the “Modern Breech-loaders,” in 1871.

The introduction of choke boring may be regarded as W. W. Greener’s greatest achievement; his previous inventions had shown his cleverness; this one made him famous throughout the world. Mechanism in a mechanical age like ours is not easy to grow famous upon. But choke boring as brought out by Greener in 1874, altered the whole system of gun boring, and made close shooting the servant of the gunmaker, where, before, it had been his Will o’ the Wisp.

We are aware that Mr. Pape, of Newcastle, considers himself the inventor of choke boring, and has been awarded a cup as such by a committee. We do not agree with that award. That his patent proves him to have had some such idea in May, 1866, that he thought might be worth protecting, is a fact. But, although he described the method in a patent, having to do with mechanisms of the actions of breechloader fastenings, he made no claim in the patent for the invention of the method of boring he describes. We believe that (whether he knew or did not know what was

possible from choke boring) he did not work the principle foreshadowed in his patent, or if he did he did not work it in the modern, successful method. We are of this opinion, because we happen to know that when asked in '73 or '74 to do his best, by way of pattern, he sent out a weapon that could not put 100 No. 6 shot in the 30-inch circle at forty yards. And, having regard to the extreme care with which the cartridges sent to try the gun were loaded, we have every reason to believe he was doing his best. Good shooting guns at that time were accidents to a great extent; with such an accident Mr. Pape had won at a public trial with a pattern of less than 130. That is our opinion of the matter, and, moreover, no English maker could guarantee any such pattern as 130 until Mr. Greener showed the way in 1874. We speak from the results of our own trials with the guns of many of them, including Mr. Pape's. The information we are able to give on this subject was more particularly derived from trials made of a number of guns from a large number of makers, sent by them for the purpose, when we formed one of the shooting party in Leicestershire in 1873 or 1874. The whole of the shooting at this trial was done by ourselves; and as some of the most fashionable London makers, and the most successful at that time at pigeon shooting, sent their guns, we became well aware of the state of barrel-boring immediately prior to the introduction of the choke bore. Mr. Greener was one of the makers who sent guns to us on the particular occasion of which we speak. These were sent back to him, and, as a result, we probably saw the first choke bore he made. This was sent up to us in Scotland, in the autumn following the trials of which we speak, and the difference between its performance at the target and that of any of the guns previously tried was astonishing to all who saw it at that time.

Choke boring has been more or less adopted by all gun-makers since that date, and it is for this reason that we say that Mr. Greener's reputation is based on the introduction of the invention. Mr. Greener makes no claim to be the inventor of choke-boring; what he claims is that he

improved an American invention to such an extent that in 1874 and 1875 no one who had got hold of the American method had any chance of making such patterns as he could



MR. W. W. GREENER.

get out of his guns. This was clearly established at the 1875 gun trials. Then Mr. Pape, who advertises himself as the inventor of the system, exhibited guns against Mr.

Greener's winning weapons : but, although he had then got choke bores of some kind, like all the other makers, which he had not the year before (if our Leicestershire trials were the test we believe them to have been), he could not, any more than they, get shooting from them that approached that of Mr. Greener's specimen guns of almost all the various bores. Perhaps it may be of interest to quote a letter we wrote to *Bell's Life* in January, 1875. At that time most of the gunmakers had got some sort of choke bore, but it was evidently different from Greener's. In that letter we mention the results of average patterns obtained by us, in 1873 or 1874, from many guns by various makers, amongst whom was Mr. Pape.

In January, 1875, every gunmaker had improved cylinders. One of these we tried on the same day we tried Mr. Greener's gun, and the record will also be found in the letter to which we refer, which follows. We would particularly call attention to the different character of the 202 pattern of another maker, with its average of $27\frac{1}{2}$ pellets on the 10-inch pad, and the character of the Greener gun's pattern with its 42 pellets on the 10-inch penetration pad. This group in the centre of the pattern is the true character of the modern choke-bore guns.

A MINUTE TRIAL OF THE SHOOTING OF MR. W. GREENER'S GUNS.
BORED ON HIS NEW SYSTEM.

By "PEVERIL."

January 30, 1875.

"At the request of the editor of *Bell's Life*, I have made a trial of Mr. Greener's new guns. To begin with, I must confess I was very much surprised at the wonderful penetration of Mr. Greener's new guns.

"The pads used were in every case obtained by myself from Mr. Pettitt, of 23, Frith Street, Soho, London. They were counted into 20 sheets each (except where stated in the following tables to have been otherwise), and lay perfectly flat and smooth in every sheet. These pads were, when penetration was to be taken, hung with string on the front of an iron target, on which they rested. Penetration was not taken with every shot, as I thought it unnecessary to take it more than a certain number of times, and it was also thought unnecessary to be very careful as to the pattern of my own gun, which does not average

more than 115 pellets to 130 pellets at 40 yards at 30-inch circle; on the other hand, a minute trial of its penetration was made, and every pad shot at by the Greener gun, and every pad (when its best charge was used) by my own gun has been recorded, the best charge for my gun being 3drs., and $1\frac{1}{2}$ shot, and the best pattern made by it 130., after several shots. A singularly good shot was made by it on the same day at another trial, but its average has been, after very many trials, discovered to be as stated above.

" The cartridges were, with the single exception of the 10-bore, all loaded before me, and I can faithfully say I saw everything put into them.

" The 19 sheets only were counted, on account of the 20th being covered with whitewash. The system used for taking the penetration was that which was used by Colonel Hawker, the proportion of shot which went through the 19 sheets to the number which struck the pad being regarded as the value of the penetration. Thus if 20 struck and 10 went through, the value would be .5.

" That my test gun is above the average will be easily seen by the following results of trials which have been made against guns sent against it by half-a-dozen first-class makers within the last year. No. 1 maker, average of 6 shots, 92; No. 2, ditto, 97; No. 3, ditto, 115; No. 4, ditto, 105; No. 5, ditto, 93; No. 6, ditto, 82, and several less, which are not worth recording. This, I think, will serve to show what sort of guns those who do not try for themselves are likely to get, even from the best makers.

" My table below records consecutive shots, and not picked ones, the first shot out of each barrel not being counted in any case.

" After seeing what close and good shooting could be done for long distances, I asked Mr. Greener to show me if he could make his gun scatter more by any alteration of the charge without worse penetration than that given by my own gun, so as to enable me to say the gun was equally fit for rabbits popping about under your feet in cover, and for ducks, wild grouse, and other game which require a long range. This was attempted in several ways, as the following table will show. That in which 304, No. 5 shot (equal in number of pellets in the charge to $1\frac{1}{2}$ oz. of No. 6 shot), and 2drs. of Curtis and Harvey powder were used, was the most successful, putting 164 shot into the circle (which I thought too many), and beating my gun's best penetration, which was not done by either of the other small charges. But I came upon Mr. Greener with this request before he had made any experiments with different charges. He says he is quite sure he can make, by an alteration of the charge, his close-shooting guns carry as much shot as the ordinary charge, scatter so much as to leave 100 shot in the circle, without reducing penetration below that of the ordinary gun with its best charge. On this point Mr. Greener

is going to make experiments. It was most noticeable that in all the shots made with small charges the pellets were wonderfully evenly scattered over the target, as indeed they were with the large charges, but not to such a degree.

"The size of the 'killing circle' at 40 yards is from about 27 to 30 inches, as nearly as I could judge with the help of a tape. That of my gun from 30 to 38 inches. But it must be remembered that if, in the 'killing circle' of my gun, a bird would be killed five times out of six, in the killing circle of Mr. Greener's gun, one bird in twenty would not get away. Even in the middle of the charge from every gun there will sometimes be room for a bird to escape. At 25 yards I thought the killing circle was from 24 to 30 inches in Mr. Greener's gun, while in mine it was from 27 to 34 inches: the want of size at 40 yards, as compared with 25, is to be looked for in the fact that at 25 yards the outside shots of the charge are near enough together to help to form a killing circle, whereas at 40 yards they have scattered so much as to make it the merest chance whether two of them are found near enough together to enter the body of any bird.

"It is well known that, as a rule, guns of great pattern are not up to the mark in penetration. With a view of thoroughly testing this, I made the following trial, on the same day and against the same gun I had used to test Mr. Greener's guns, of a gun whose owner was proud of it, and who had great opportunities of getting a good one. The penetration was taken at Pettitt's targets of 30 sheets, and is therefore only of use in comparing this average close-shooting gun with the gun which tested Greener's. Cartridges for this trial were some of those from the usual square boxes of Messrs. Eley:—

Pattern.	No. of shot which struck pad.	No. of shot through 30 sheets.	Value of Penetration.
Peveril's gun ... 146	24 18 —	8 4 —	.28
	Total 42	Total 12	
Average close, first shot ... 198	16	3	
Shooting gun, 2nd shot ... 229	39	9	.21
3rd shot ... 178	—	—	
Average* ... 202	Total 55	Total 12	

* It is doubtful in this case what Eley's cartridges contained. We cannot remember, if we ever knew — ED. *L. and W.*

"This trial fully bears out the general opinion of the penetration of close-shooting guns, and in my opinion goes to show Mr. Greener has not perfected an old system, but invented a new one.

"In all cases, if the paper was broken enough to admit the light through when held up, the shot was considered as through.

"I allowed Mr. Greener to choose his own gun, it being his best, and not an average gun I wanted to see shoot. The gun was in the rough. On the other hand, I had the whole management of the trial, and nothing was done except at my suggestion."

TABLE IN PEVERIL'S LETTER TO "BELL'S LIFE."

"Trial at a circle of 30 inches diameter, from 40 yards, with 3drs. of Pigou, Wilks, and Laurence's No. 3 powder, and 1½ozs. No. 6

GUN USED.				No. of Pellets on 30-inch circle.	No. of Pellets through the first sheet of the pad of 20 sheets.	No. of Pellets through 19 sheets of the 20-sheet pad.	Value in decimals of total or average penetration, being the proportion of shot which went through 19 sheets to the number which struck the pad.	No. of sheets deepest shot through.
Mr. Greener's	..	..	1st shot	209	34	29		
"	..	..	2nd "	231	43	31		
"	..	..	3rd "	207	51	38		
"	..	..	4th "	244	no pad	no pad		
			223 average		128 total	98 total	.785	
Peveril's	..	..	1st shot	130	19	11		
"	..	..	2nd "		15	10		
"	..	..	3rd "		20	11		
					54 total	32 total	.592	
Mr. Greener's	..	..	1st shot	233	53	32		
(With alteration to 3½drs. and 1½ozs.)	..	..	2nd "	254	32	25		
			243 average		85 total	57 total	.670	
Mr. Greener's	..	..	1st shot	151	18	10		
(Alteration to 2½drs. No. 6 powder, same maker, and 1oz.)	..	..				
Mr. Greener's	..	..	1st shot	246	48	22		
(Charge, 2½drs. No. 6 Curtis and Harvey, and 1½oz.)	..	..	2nd "	234				
			240 average					
Mr. Greener's	..	..	1st shot	164	34	24		
(Charge 2drs. Curtis and Harvey, No. 6 and 304, No. 5 shot, being equal in point of number of pellets to 1½ozs. No. 6 shot).	..	..				
Mr. Greener's	..	..		179	31	18		
(Under same conditions as last, with charge of powder altered to 2½drs.)	..	..		181				
			180 average					
Mr. Greener's	..	..	1st shot	281	63	53		
(10-gauge, 4drs. P. W. and L. No. 3, and 1½oz. No. 6 Newcastle chilled shot, at a Pettitt pad of 40 sheets)	..	..	2nd "	251				33
			266 average					

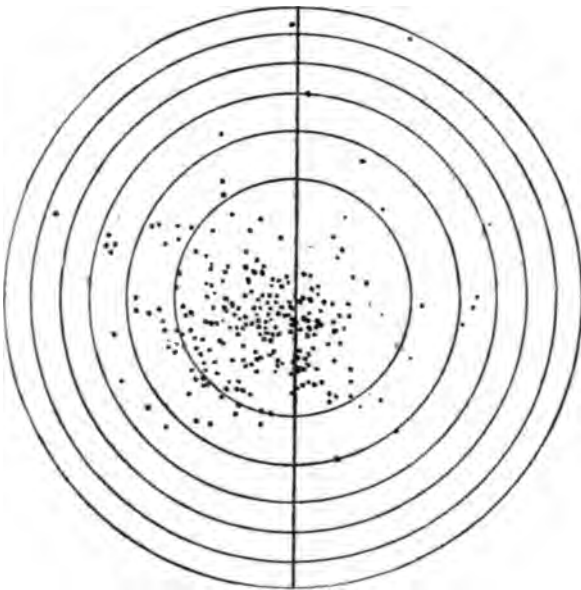
Newcastle chilled shot, used in all cases except where otherwise stated; the guns—a 12-bore of Mr. Greener's own choosing, and a 12-bore that was the best 'Peveril' could bring against it; these were the only guns shot, except a 10-bore, trial of which is given on the preceding page.

This method of boring gun barrels introduced into use an entirely new principle, that of constricting the bore at the muzzle. Great was the opposition to this new departure (and practically every gunmaker was in arms against it), yet they all now use it. So great was the interest shown in choke bores, and so bitter were its enemies, that Mr. Walsh, the editor of the *Field*, instituted a special trial (1875) to try the merits of the new system. In the results the choke bores of W. W. Greener came out first in every class, *i.e.*, for 8-bores, and for 12-bores, and for small bores; beating sixty-eight guns and thirty-three competitors. Later trials for wear and tear (1875), at pigeons (1876-7), and of explosives (1878), only confirmed the results already obtained, and choke bores had to be regarded as the hardest shooting guns.

W. W. Greener's second book, "Choke Bore Guns" (1876), contains an explanation of this boring, and a record of various gun trials, and includes a recommendation for Chilled Shot, which he was instrumental in introducing at this time, which was used at all the public gun trials. With these early public trials we had no sympathy. A system of taking selected 30-inch circles was used in order to count pattern. The *Field* conducted these trials, and we have frequently protested that as the highest choke bores cannot always be relied upon to put their shot in the centre, or to shoot straight, that this system of shooting first, and putting up the target afterwards, was ridiculous. Lately the *Field* have acknowledged that some chokes do not shoot to the centre, and thus have admitted in a roundabout fashion that our views were just. This admission has been made within the last year (1896). To us it appears a little belated, for during the twenty-three years since choke bores came out, great improvements have been made, and anyone who cannot now make the highest chokes shoot to the centre is behind

his neighbours. Lately, in criticising a reprint from the *Field* called "Sporting Guns and Powders," we said on the subject of testing guns for evenness of spread and truth of direction :—

" Another point we may mention, as it seems to be the last phase to which this sort of complicated experiment has got. It is that of taking shot patterns by means of six rings, each of the same superficial area, within the 30-inch circle. It is a good idea to test evenness of distribution of the shot pellets, but we rather think that this method misses its mark absolutely. It is obvious that, as with all guns, the



10—20-Bore, with $\frac{1}{2}$ oz. shot.

centre of the target is better patterned than the outsides: so with these rings the evenness of results of the distribution of the pellets can best be attained by *not* shooting straight. It does not matter on which side, or whether top or bottom of target is struck, and the opposite part of the target missed, evenness from a close-shooting gun, or at near distance, must on this method go to the shots that are off the centre. Tremendously elaborate trials have been undertaken, simply in order to test evenness of spread of shot by this means. Twelve targets out of many hundreds made have been photographed and reproduced, and some of this twelve show a very great want of centre shooting. Yet this does not deter but improve the record of regularity by the method

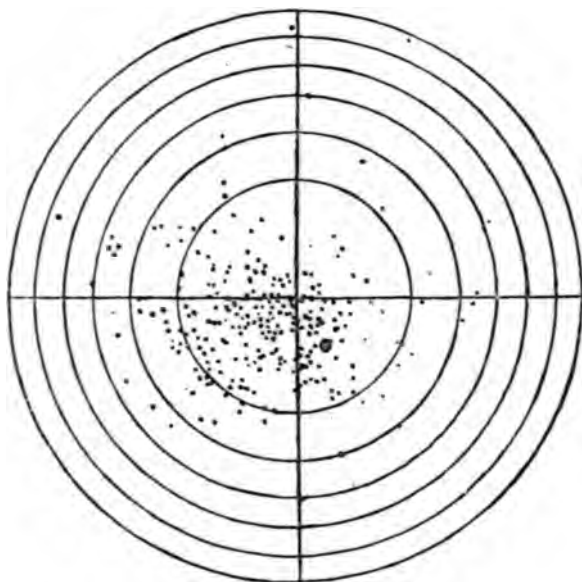
of counting. We are surprised that anyone could have made such an obvious error of method; particularly anyone who in another place says, 'We may mention that full chokes often throw the charge off the centre of the target.' That is what we have said for many years, and for that excellent reason we should give the records greater value had they been attained by means of targets which penalised, instead of flattered, shooting that was not central. By aiming at the dividing line between the second and third ring, the best shooting would be obtained according to this system of measurement. Even one of the twelve photographed targets shows this, as the second ring is unusually well filled, it having thirty-five shot in it at twenty yards (20-bore $\frac{7}{8}$ oz. of shot). But on our drawing a line down the centre of the target we find only five pellets on the right side of the line and thirty on the left. If the aim had been still more to the left the result in this deluge of figures would have been even better for the gun and load, but the game would probably have been missed all the same.

"We give a reproduction of the photograph mentioned with our own vertical line drawn down the centre of it."

Now, if we draw another—a horizontal—line at right angles with the other, we shall have a perfect test of evenness of pattern. One day lately we pointed out this to Mr. Greener, and while he admitted that it would be a severe test of evenness and central shooting, he professed himself quite willing to adopt it. That Mr. Greener has in past years failed to build guns that could have stood such a test is only to say that he was the first to experiment with high choke bores. Since then he has made guns for the American professional pigeon shots, one of whom, at thirty yards rise, killed 100 pigeons without a miss one day, and 99 out of 100 the next. Now, whatever we may say about the American pigeon, as compared with our own blue rocks, yet no gun that did not shoot absolutely *to the centre* could do work like that at the distance; not even if the birds were owls sitting upon their own barn doors. One hundred and ninety-nine birds out of 200, and the other dead outside, was the record in the match referred to.

In the early days of the choke, shooters rushed at them; but after the first attempt the majority of game shooters became convinced that they were not good enough for game shooting. The general impression amongst shooters was that they themselves were not good enough to use such

close-shooting weapons. We do not wonder at this, for it is not one man in ten that can trust himself to plate a gun correctly, so that the majority of sportsmen never found out whether their failures were the fault of guns that did not shoot straight or of their own inability to aim accurately. We think that where there was one who failed from inability to aim accurately, there were two who failed because the guns did not shoot to the centre. But unquestionably the majority of failures to shoot with the choke bores were the outcome of a little bit of both.



The same 20-Bore Target.

Add six inches of want of accuracy of aim to six inches of jump at forty yards, and you have a clean miss from a high choke bore, such a miss as we have many a time made with one of the early choke bores at a straight-away shot. Such results soon disgusted the majority of impatient shooters, who took to their old weapons again with the enthusiasm of the returned prodigal son to his veal. When a man is shooting every day he has no time for experiment at the targets. Even if he had, the six inches off the centre, that was a frequent occurrence with the high chokes of early

days, was an inadmissible fault for a game shooter's gun; but a very difficult one to fix on the gun itself. Thus choke bores became thoroughly unpopular, in spite of the fact that the pigeon shots all used them. The difference was that the pigeon shots had time, or made time, to plate their guns, and would not shoot with an untrue gun, and the game shooters, without trial, mostly attributed the fault to their own want of accuracy, even when nothing but the high kick of the choke was in fault. They were, in fact, confirmed in their impression that the fault was theirs by seeing other men, particularly at pigeons, do well with choke bores. They had not learnt that choke bores differed a great deal more than the guns of the old style, which Joe Manton, Egg.



APPEARANCE OF GREENER'S HAMMERLESS EJECTOR.

Lancaster, Boss, Purdey, and William Moor had spent the best part of a century in bringing to perfection. They expected, in fact, that chokes of a year's standing should be as perfect, as such, as the old style were as cylinders. But they were not as perfect. On the contrary, they were, like every new thing, mostly bad; and it was only by chance that a gun was obtained that satisfied the best judges.

The reaction was not to modified choke bores, but right back to cylinders, and it has taken twenty years of calling modified choke bores by the name "cylinders" to induce sportsmen to return to the use of the choke-bored barrel. Most gunmakers are, however, now using the method of

boring more and more ; but the return to the choke bore is accompanied by great care to see that the weapons do shoot straight. Some of this care has been brought about, we know, by our own early discovery and publication of the peculiarity of the shooting of the choke bore.

Mr. W. W. Greener has informed us that he thought we aimed specially at him when we were doing this, but we are sure he is now convinced that we were simply stating our own experiences for the benefit of others. It is, we may say, the general recognition of the peculiar tendency of the high choke bore to erratic movement that has brought about its cure and its gradual return to favour. Of course, there will always be men who cannot use a choke bore, and good



MR. W. W. GREENER'S "UNIQUE" HAMMERLESS EJECTOR.

shots too. Of course, also in covert shooting the choke bore will generally be more or less handicapped, for it is most unusual to get pheasants so high that cylinders cannot reach them, and in every other class of shot obtained in covert the cylinder takes the lead, because, as a rule, although accuracy is good, quickness is better. The reverse of this is, perhaps, true in the open ; hence the re-advance to favour of choke bores under their various nomenclature. To parody the poet,

A choke by any other name will shoot as close.

In 1880 a new hammerless action was produced which occasioned the lawsuit, *Couchman v. Greener, Messrs. Westley Richards* holding that it was an infringement of

their patent action, but that this was not so was fully proved by Mr. Greener winning in every Court up to the House of Lords.

The next invention taken up was the Ejector Gun, first introduced by Mr. J. Needham, in 1874, but altered and made suitable for the Treble Wedge Fast action by W. W. Greener, in 1881.

The success of "The Gun and its Development" seems to show that Mr. W. W. Greener has been scarcely less successful as author than as gunmaker. The first edition of this book, published in 1881, and consisting of three thousand copies, was quickly sold in spite of its many mistakes, and since then four enlarged editions have been disposed of, and the sixth edition, rewritten in 1896, from which many errors have disappeared, is now, we hear, nearly exhausted. "Modern Shot Guns" had a second edition, and "The Breech Loader," published in 1892, has reached its sixth edition. Mr. W. W. Greener has lately relinquished his inventions to his son, H. Greener, who is continually improving the older patterns and mechanisms. One of the latter's inventions is the divided tumbler ejector mechanism, whose efficiency and smoothness of working, Mr. Greener tells us, place it at the head of the ejector systems. We regret to say we have no personal knowledge of this mechanism: that is, none based on actual trial. To him, also, is to be attributed a new automatic safety. W. W. Greener has had his hands full over a great law case in Australia, 1895-6. It was a case of fraud, and for his action in this matter he has received the thanks of the trade. Mr. W. W. Greener claims that his factory in St. Mary's Row, Birmingham, is the largest sporting gun factory in England (in all, 37,000 square feet), and that in no other gun factory could you see the process of gun-barrel forging being carried on.

MR. W. W. GREENER'S "UNIQUE" HAMMERLESS EJECTOR.

Mr. Greener describes this ejector, which is the invention of his son, Mr. H. Greener, as follows:—

"In addition to the modifications of the two chief principles of ejecting—the Needham and the Decey—there is a third principle,

found only in one gun, the 'Unique' hammerless gun. This gun closely resembles the Needham in the form and arrangement of the lock-work, and in the fact that, instead of a separate lock to work the ejectors, the expulsion of the case is effected by the ordinary mainspring; it differs from the Needham, and all varieties of that mechanism, in principle; the ejection of the fired cases being brought about after the gun is cocked, instead of before that operation is completed. Compared with the W. W. Greener ejector of 1880, the essential difference consists in the tumbler, which, instead of being of one piece, is jointed, the fore-arm by which it is raised to cock being pivoted in the tumbler instead of solid with it. The parts are then so adjusted that the action is as follows:—On the gun being opened after firing, the tumbler is raised, both parts moving substantially together until the sear nose is beyond the bent: the gun is at that time opened to quite its full extent: at this moment the point of the fore-arm slips past the tripping point on the cocking swivel, and by the



APPEARANCE OF GREENER'S WEDGE FAST—OPEN.

power of the mainspring is driven down upon the projecting ends of the ejector levers and the fired cases are thrown out. This action is most sharply brought about owing to the great strength of the mainspring and the sudden stop to the blow by the fore-arms of the tumbler driving the lower ends of the ejecting levers until they are stopped by abutting against the cocking swivel. The gun may then be loaded without any further opening of the barrels. As it is closed, the back or striking part of the tumbler descends until retained in bent by the sear; and remains there at full cock until the sear is released: the fore-arm, carried down on its pivot, becomes shorter as it descends. When the upper part of the tumbler falls to fire the gun the fore-arm is thrust forward until its extremity again engages with the tripping stud on the cocking swivel, and thus is ready to perform the like motions of cocking and ejecting upon the gun being reopened.

“ Upon comparison with the systems already described, the

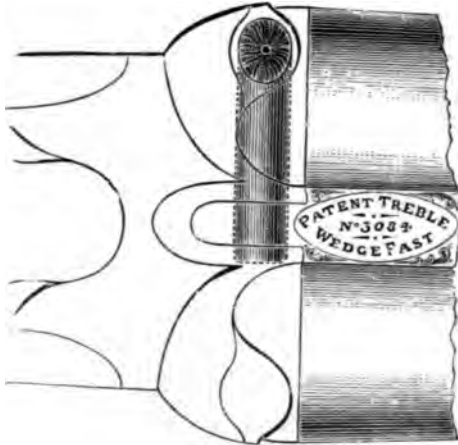
advantages possessed by this gun will be at once perceived: first the result obtained is precisely that of a gun having extra locks for the specific purposes of ejecting, yet in this gun there is no extra mechanism. The gun opens no wider than is requisite to insert the loaded cartridges, and it is cocked before it can be opened even so far as that. As there is but one mainspring, and that so adjusted that only a slight travel is required of it, the gun is easy and pleasant to manipulate, the whole of the mechanism working smoothly without any appreciable jerk, and even if the barrels are thrown open with a sharp movement, the adjustment and position of the ejector levers and mainspring automatically act to check any violent stoppage of the barrels by being brought suddenly against the stop—a plan which absolutely prevents jar or strain upon the hinge joint, and thus adds to the durability of the gun as well as rendering its manipulation much more pleasant. This point is thought much of by American experts, who for many years have sought to devise an efficient ‘check hook’ to prevent a strain the arrangement of the ‘Unique’ ejecting mechanism entirely obviates.”

Greener’s automatic safety bolt, illustrated on p. 393, as it is easy to see from the drawing, is intended to be removed by the pressure by the finger of the trigger. It is not intended to replace the trigger safety bolt, but to be used in conjunction with it.

Mr. W. W. Greener is one of the latest converts to the one-trigger principle. His new invention is on totally different lines from any that have yet been put forward. It is ingenious and simple, and to explain it as shortly as possible we would say that the trigger acts as a lever hinged in its centre. The consequence of this central pivot is that when the trigger is pressed below the pivot it throws the upper part of the trigger forward; when it is, on the contrary, pressed above the pivot, it throws the upper part of the trigger backward. The arrangement of the sears to meet these two movements is, of course, easy, and can readily be understood.

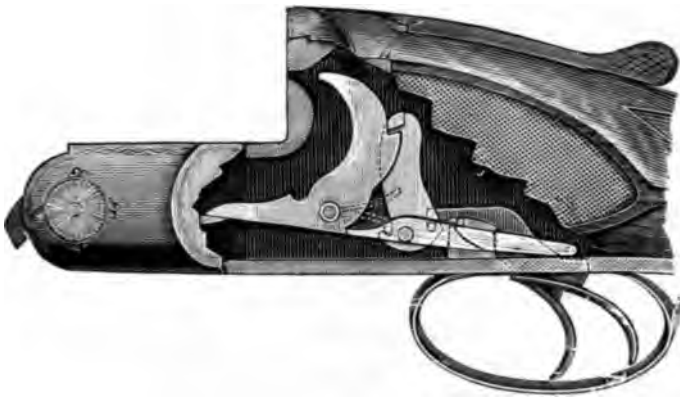
It will be seen that the pressure of the lower part of the trigger not only lets off the left barrel, but it also locks the right trigger, and the reverse is true also; that is, the pulling of the right locks the left. It is obvious also that if the finger is placed in the centre of the trigger the

pull will affect one barrel only, and that both cannot be discharged together. Theoretically a pull exactly in the centre would not, of course, let off either barrel, because it would merely be pressure upon the fixed pivot on which



GREENER'S TREBLE WEDGE FAST.

the trigger partly revolves : but in practice this equal pressure is impossible. There are minor details, but that is the broad principle of the action, and the rest is not, we fancy, material.



GREENER'S AUTOMATIC SAFETY BOLT.

If this action ever becomes fashionable, "fit" will involve a good deal more than it does now. It will not only be necessary that a gun should fit for length, bend,

cast-off and balance, but the trigger will also have to fit the shape of the hand and the fingers.

Mr. Greener has in his first gun placed the trigger where the right barrel trigger usually falls. We think this is a mistake. It certainly is so for our own particular use, but we think on general principles the trigger should be as near the trigger guard as possible; however, that is all matter of detail to be attended to for each individual shooter.

Mr. Greener undertook to make the gun fit us in order that we might give it a fair trial, going direct from the use of a double-trigger to a single-trigger gun. We explained to him that, in questions of this kind, opinions given without actual trial are of very little use. We think that questions of mechanism are those in which editorial opinion may be of some use; but where it is only a question of quick handling at game, no opinion of one man is any use whatever to another. Thus it happens that all our reports of single-trigger guns have been based upon what we have been able to get out of them at moving objects. Before describing what we did with the new Greener single-trigger we should say that, although it was set to bend and cast-off pretty accurately for us, it did not fit in length, owing to the fact that, as is the habit of all gunmakers, Mr. Greener took the length from the right-hand trigger instead of the left, which is the one that we always shoot first. Thus when we went down to Mr. Watts' ground to try the gun at overhead clay birds (double rises) we felt it to be distinctly long. An inch too long in a stock makes a very great deal of difference to a shooter's performance, and we have no hesitation in saying that had the trigger been an inch further back we should have scored better with the first barrel than with the second, which was exactly the opposite of what we actually did. Mr. Watts sends his clay birds at more than the ordinary pace, and to do good work with them there must be no handicap. In this case there were several. The trigger was placed right for our second or right barrel—wrong, as we have said, for the left or our first barrel. The result of the shooting

incidentally proves that no two triggers can both of them be in the right place exactly, and it also seems to us to indicate how much use has to do with the matter. Here were we, who have shot for thirty years with the same fit exactly, dreadfully handicapped in having to reach for the first barrel a distance that we are in the habit of reaching fairly successfully for the second barrel. We may say that the score was accurately kept by Mr. Osborn, the secretary and assistant manager of the London Sporting Park, who, by the way, informs us that these clay birds have been timed by Mr. Watts to come over at the rate of sixty miles an hour.

In the first eighty shots—that is, forty double rises thrown over us from the tower—we had eighteen misses with the first barrel, and only ten with the second; that is, thirty kills to ten misses with the second barrel, and twenty-two kills to eighteen misses with the first barrel (that in which the length of trigger is different from our own measure). In regard to these ten misses with the second barrel, we should say that on several occasions we pulled the wrong trigger (that is, pulled the same trigger twice), and therefore had to make a third alignment and third pull for the second barrel. This occurred seven times in 160 shots, or seven times in 80 second barrels; but we have no record of how many of these related to the string of forty double shots of which record is given below. When it is remembered that this was the first occasion of our using this gun, that it had not been made to fit our hands, and that we had to remember to do something entirely new between the first and second shots, we do not think that the record will be taken as indicating that there is a difficult task for habitual double-trigger men to learn this new method of pull.

Mr. Osborn insisted that we ought to take the pattern of the gun, as he considered it a very great handicap to shoot with a choke bore at these clays coming over within fifteen or twenty yards, and sometimes less, of the gun muzzle. This we did, and found the patterns to average considerably over two hundred, at forty yards and in the

30-inch circle; so it will be seen that the gun is a full choke. The handicap therefore consisted :—

For the first barrel :

1. In wrong length of stock.
2. In extreme choke.

For the second barrel :

1. In pulling the wrong trigger several times and having to make new alignment and a third pull.
2. In extreme choke.
3. In having to remember something entirely new.

The following is the score :—

										Kills.	Misses.
01,	10,	01,	01,	00,	11,	11,	11,	11,	01	13	7
11,	01,	00,	11,	11,	01,	11,	01,	01,	01	13	7
00,	01,	11,	11,	11,	01,	00,	01,	10,	10	11	9
10,	11,	11,	11,	11,	11,	01,	11,	00,	10	15	5
Total ...										52	28
First Barrel ...										22	18
Second Barrel ...										30	10

We think that this indicates that there is nothing in the finger movement required that cannot be satisfactorily learnt in a short time.

At the Haymarket establishment, presided over by Mr. Oliver, is always to be found an enormous stock of guns, rifles, and ammunition. There, too, the purchaser can make arrangements with the shooting member for trials, fit of stock, and practice at a private shooting ground, half-an-hour's journey out of town.

CHAPTER XXVIII.

HOLLAND AND HOLLAND.

A Single-Trigger.

THIS time it is Messrs. Holland and Holland, of 98, New Bond Street, who bow to the prevailing fashion. Indeed Mr. Henry Holland has for some time been paying a very great deal of attention to single-trigger double-barrel guns. We believe he has either five or six different patents for them, but until now he has not used his patents, except as earth stoppers; that is to say, he has used them in order to keep other people from treading the particular path toward perfection that he desired to tread himself. The outcome of all this paper protection has at last arrived at that stage at which a good maker is willing to risk his reputation upon it. For, as Mr. Holland tells us, it does not do to turn out guns that will require tinkering when they get out to the Colonies or to India, whence they may not return for years. It is necessary that all new inventions should be subjected to the most severe test before they are adopted by a man who has credit, and a great business to lose.

Opinions upon new inventions everyone will have; but it is not everyone whose opinions ever arrive at such assurance that he would be prepared to risk his fortune upon their correctness. That is about what an established gunmaker does when he puts forth a new invention. Especially is this the case when the nature of the invention is a one-trigger gun of a kind that nobody has made successful before. The mechanism of the new weapon is simplicity itself in appearance. Technically it might be described as a sliding bar above the trigger, a bar set free, by the first pull, to slide under the second sear, there to

be ready for the second pull off. This is, in mechanics, equivalent to a very long pull off of the trigger, and the object of both—a long pull or a sliding bar—is to prevent the involuntary pull, that kick (or rather reaction after recoil) is responsible for, from taking place *after* the trigger has become connected with the second sear. If the involuntary pull can be so regulated as to come upon the trigger before it has returned to its normal position, or before it is intermediately connected with the second sear,

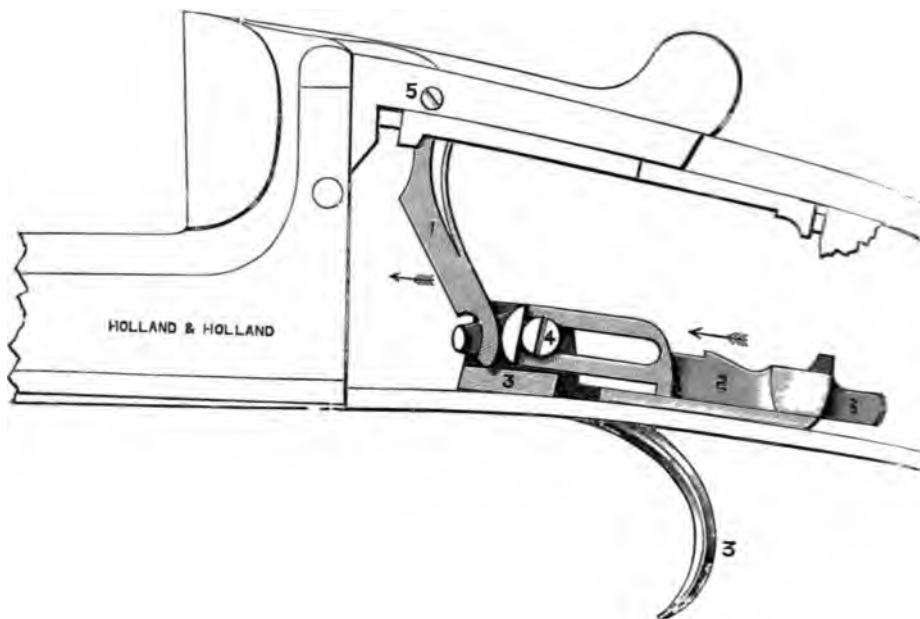


FIG. A.

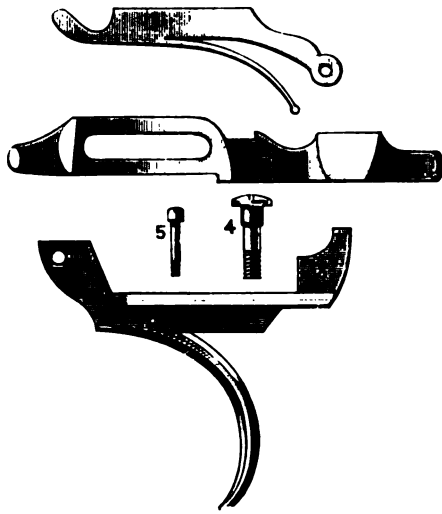
HOLLAND'S SINGLE-TRIGGER IN POSITION TO FIRE THE RIGHT BARREL.

it is obvious that a second or involuntary pull will not let off the gun.

A long dragging pull off has disadvantages, and it is to meet this that Mr. Holland has, as it were, divided the trigger into two parts, the movement of one only of these being felt by the finger. By this means he has accomplished the task of giving the shooter the smallest possible length of pull off, which, however, is made equivalent, by means of the sliding piece, to a good long inch of trigger play.

The action is this : the first trigger being pulled and the

shot fired, the trigger is relieved, and it returns to its normal position. After this movement, the sliding rod has still some distance to go (under pressure of the same spring that rights the trigger) before the sliding rod travelling forward takes its projecting solid piece under the second sear, ready for firing second barrel. It is upon the position of that particular solid lump that the whole invention turns; that is to say, it is no use pulling until the lump is right under the sear, and it cannot get there without a certain measured time to do it in—a time, be it remembered, greater than it takes for these various processes;—fall of first striker.,



THE PARTS COMPLETE OF HOLLAND'S SINGLE-TRIGGER.

ignition of cap, explosion of powder, expulsion of shot, recoil backwards, and reaction forward from the shoulder. This is the principle of the timer, *i.e.*, a spring that does a certain amount of work in a given time. In this it will be seen that Mr. Holland's single trigger differs from that of Mr. Boss, and also from that of Mr. Purdey; both the latter depend, for their freedom from the double involuntary discharge, upon the necessity for reaction from recoil to act on the finger, and, therefore, trigger, before a second barrel can be fired. Mr. Holland accomplishes the same end by giving his trigger spring two distinct operations to perform

before any second discharge can be effected by means of pressure on the trigger.

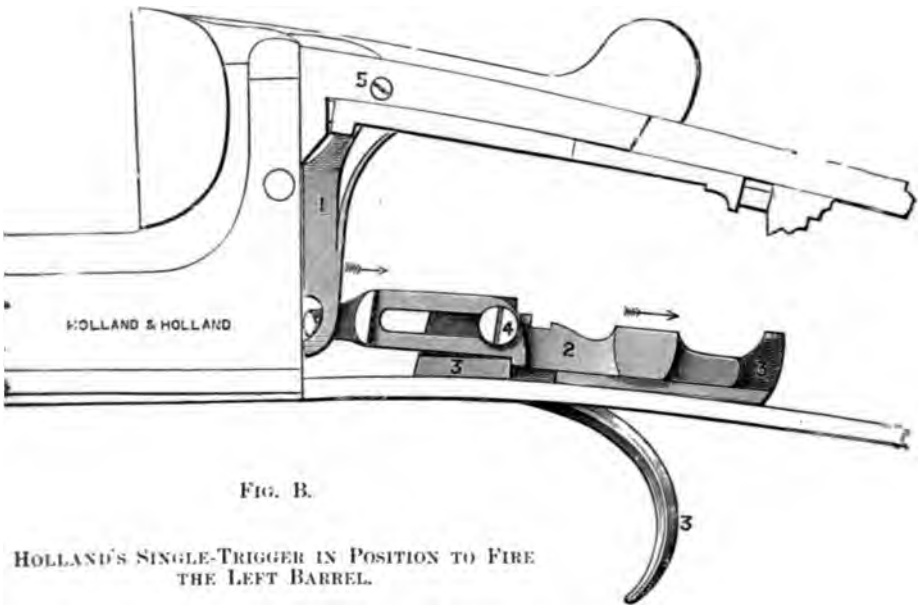
It is all a question of measurement, Mr. Holland thinks. He has measured the time taken by the spring, and also the time taken for recoil and reaction, and he gives his spring plenty of law; in fact, gives it a lot of work to do after reaction from recoil has taken place. So much does he give it to do, in fact, that we rather questioned whether it could do all the work before we should want to fire the second barrel. However, in practice, this doubt did not prove well founded, although we did our best to pull a second time too quick for the action of the spring to bring the trigger into normal position and the sliding piece under the second sear.

Mr. Holland tells us that the gun he has shot with himself this year has had 4,000 shots fired from it without going wrong, and that he is perfectly confident that it cannot go wrong.

Some of this shooting we have seen. Unquestionably Mr. Holland put in his second barrel quick enough, and scored too, but then he is used to shooting with the single trigger, so that we will describe our own performance, as we have hitherto only tried the single trigger by way of experiment, and do not shoot regularly with one.

We have made no exhaustive trial as far as the number of shots go, but we have given the gun a good severe test all the same. After having about 150 clay bird double rises over the trees at Mr. Holland's ground, at which the second barrel always behaved well, and the "kills" became rather monotonous, we adjourned to the workshop: but before describing the proceedings there we should say that the loads used at the clays were of all kinds: 37 grains Schultze and $\frac{7}{8}$ ozs. of shot, 42 grains and $1\frac{1}{8}$ ozs., and 45 grains and $1\frac{1}{4}$ ozs. The workshops being uncommon handy at Mr. Holland's ground, we soon had off the single-trigger action, and by way of seeing whether "moth and rust" were likely to corrupt, two single-trigger actions were placed in water and a shovelful of ashes fresh from the fire thrown in and stirred up. The actions, of course, came out covered with

big and small ashes. In this state they were returned to their respective guns, and we began firing again, this time indulging in snap shooting in order to see if we could be too quick for the spring in this state of dirt. We do not think any one could fire the double shot quicker than we did, but we had no hitch whatever. Thus with grit and dirt purposely introduced into the action, to such an extent that we could hear it grinding when the action was forced into the woodwork; yet Holland's single-trigger stood the test triumphantly. The trials, therefore, were thoroughly satis-



factory as far as the gunmaker was concerned, and although we have said that it takes 100,000 shots, fired from each of 100 guns, before anyone can swear by a new action, yet if we waited for that we should never have anything new at all. We believe that this action is a thoroughly good one. Having no great liking for trying new guns which do not fit, yet we shot very satisfactorily with this single trigger. If we have any more of this kind of work to do we will keep the score, for in our opinion, when it is a case of a new trigger, the actual score is better than an opinion,

as a guide to the ease of handling. This time we missed, we imagine, about 10 out of 150 overhead double rises, about half of the ten with the second barrel; but we rather fancy the springs of the clay bird traps could be tightened up with advantage. A good deal of the shooting was done, however, right under the foot of the trees, which compensated the want of speed. Mr. Holland put in some very smart work with a second specimen of the new one-trigger. Since writing the above a large number of these guns have stood a season's work without hitch.

Mr. Holland, who claims for his gun that it has no more pieces than a double trigger, describes the technical arrangement of it as follows:—

“A shows the position of the mechanism after the gun has been opened; the slide, 2, is in the position to act upon the right lock. B shows the position of the slide to act upon the left lock, the right barrel having been fired. 1 is the arm which works the slide to and fro, and is acted upon by the top lever. 2 is the slide which has a projection on either side, one being about $\frac{3}{4}$ inch in front of the other. 3 is the trigger upon which the slide works. 4 and 5 are two screws. When the top lever is pushed over to open the gun in the usual way, the arm 1 is forced back, and carries with it the slide 2, so as to bring the projection on the slide in position to act upon the right sear, as shown in woodcut A. When the right barrel is fired, slide 2 moves forward, and is then in position to act upon the left sear. I claim first, that the mechanism is exceedingly simple, having only the same number of parts as an ordinary gun, viz., three limbs and two screws, and all the parts are strong. Secondly, the mechanism is so constructed, that dirt and rust are not likely to affect its proper working. The slide works freely and loosely upon the trigger, and this part of the claim I think we fully substantiated before you this morning, as, after having put the mechanism to the very severe test of placing it in a bowl of water, into which we had previously put a half shovel of cinders and ashes, we shot the gun without cleaning or wiping in any way. If you will remember, there was no question of the slide not acting quickly enough, even under these circumstances, as I fired a number of shots as quickly as I could without the slightest hitch, and you did the same with the other gun. I also think that the short pull we are able to do with is an advantage in single-trigger guns. I would also mention that we are able to use locks with intercepting safeties to them, and we can so arrange that the left barrel can be fired first, if desired, but this is a point I think very little of.”

Early History of the Firm.

The history of this firm of gun and rifle makers extends back to the year 1835, when it was started by Mr. Harris J. Holland, a good sportsman and a fine shot, well known for years at the Old Red House, Hornsey. Pigeon shooting, however, was not by any means his only practical connection with the sports of the field, for, as is well known, he rented the Edmund Byers Moors, in Durham, for some thirty years, and used them as subscription moors. As showing the increase in the value of moors in the north of England, we may mention that he paid £100 per annum for these large and very prolific moors. Probably they would let now for £1,000 a year.

It was on these moors that Mr. Henry Holland, when a boy of fourteen, shot his first grouse, so that his experience in the field has been a long one, for he has kept up his shooting every year since then in spite of the fact that he served an apprenticeship of six years in the workshops of his uncle in order to acquire a practical knowledge of his business. His uncle, who had retired from the management for twenty years, died in 1895, at the age of ninety. Then, after thirty-three years of work in it, the business came to Mr. Henry Holland, who, in order to show his appreciation of the value of Mr. Froome to the firm, forthwith made him a partner. Mr. Froome was apprenticed to the firm forty years back. It was, in fact, in 1883, when the late Mr. Walsh held a rifle trial in London, that Mr. Froome became celebrated in the eyes of sportsmen, and especially those who were fortunate enough to stalk the red stag in Scotland, or invade the Indian or African solitudes in search of big game. We do not mean to say that Holland and Holland could not build a rifle before that date as well as now; but what we do say is that the phenomenal success of their rifles at the trials in question set a higher standard for sportsmen and gunmakers alike than that which had satisfied both before. Of course it is a fact that most of the crack makers did not compete at those trials. Those who had most to lose were quite right in risking nothing. But

Messrs. Holland already held a high position as rifle-makers, and were doing a large business as makers of Express and big-game rifles, fitting out a great many of the more important expeditions to foreign countries. For instance, they supplied the Petherick Expedition with over a hundred sporting rifles, when Mr. Petherick was H.M. Consul at Khartoum over thirty years ago ; also that well-known sportsman and authority, Sir Samuel Baker, had most of his expeditions fitted out by this firm.

So it will be seen that they had much to lose in case of failure, but they had so much confidence in the accuracy of their manufactures that they decided to run the risk, and entered for the competitions. The results completely justified this confidence, as they won the whole of the ten series of trials, starting with the 295 rook rifles, and going up to 4-bore elephant rifles. The tests included nearly every class of sporting double rifle then made.

In one or two instances they were beaten by individual targets at 50 and 100 yards, but they always managed by the help of the 150 yards range to make the best aggregate, and so won for all the bores tested. Prior to these trials various diagrams had been made by Messrs. Holland with Express and other rifles, which had been published in various sporting papers, and a good deal of scepticism existed, especially amongst gunmakers, as to the correctness of the fine targets shown, but the public trials carried out by Mr. Walsh fully substantiated the former tests, as some of the results were even finer than any of the private ones.

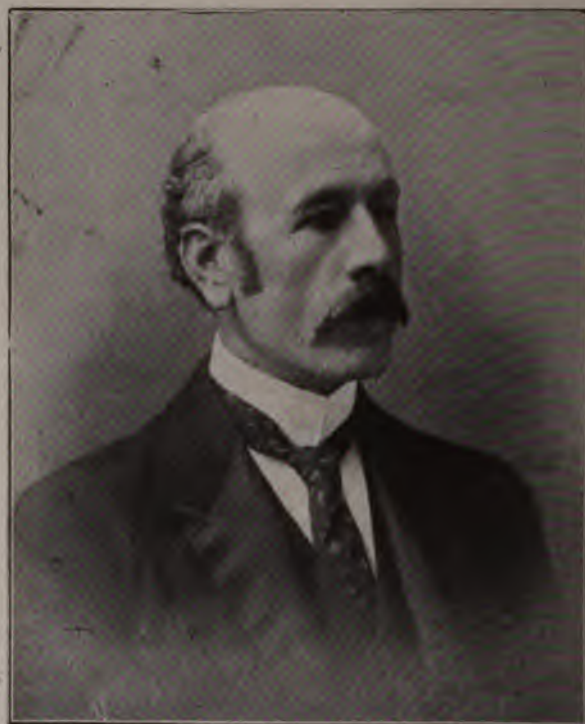
We do not say that as good work was not done by some makers before as it has been since these public trials, but we are quite sure that the majority of makers were not in the habit of turning out such work before the date in question as they have turned out since. These trials had this effect, that they taught sportsmen who had not had opportunity for the self study of rifle shooting what sort of a diagram to expect from a new rifle. It is a strange thing that so much inaccuracy had been hitherto put up with by sportsmen, for the match rifle had been brought to a high pitch of perfection. The fact is that the manufacture of

sporting rifles had settled down into a very few hands indeed ; these were good ones, but there was no recognised standard of merit by which to compare, and when a fortunate possessor of a Scotch forest went to his gunmaker for a rifle he was undecided whether he ought to accept as good an 8in. diagram or a 4in. When we say this we do not, of course, allude to such experts as the late Horatio Ross, Sir Henry Halford, or Lord Lovat, who were all as well acquainted with the possible excellence of rifle making as the man in the street is to-day.

The good shot then had the advantage over the bad one, even in rifle buying, and as a matter of fact he has never lost that advantage. The reason is simple : no man can be certain of the honesty of the diagram made in his presence by an expert with a double rifle. The expert can, if he elects to do it, accommodate his aim to the peculiarity of the rifle he is using, and thus bring the barrels to shoot the same bullseye by his own judgment ; whereas, perhaps, they still require the rifle expert's regulating skill to bring them to shoot the same spot in the hands of one who, although perhaps a superior marksman, does not know the individuality of the particular pair of barrels he handles.

No sportsman should be expected to take thought between the right trigger and the left one. It is quite enough if he can accurately judge the distance and change the sight as occasion demands, and shoot well in front of his game if it is moving. To ask him to make different allowance for different barrels is ridiculous, and in order that he should be absolutely certain on this point there is nothing like a personal trial. It is quite right that the expert should make a target in his presence and show a good diagram. This will prove that each barrel shoots true to itself, but it will not prove that the pair of barrels shoot true with each other. Mr. Holland has a mechanical turn of mind, as the simplicity of his inventions attests. In conversation with him it is easy to discover a man of the world ; one who watches for the turn of the tide of fashion and is ever ready to meet it. Not that it is easy to discover his secret thoughts, for we are not quite sure that Mr.

Holland does not, to some extent, subscribe to Talleyrand's view that language was given him in order to conceal his thoughts. Business is business, and it would never do to enlighten everybody upon what is going to take place the day after to-morrow; nor how a good gunmaker prepares to meet it. Get Mr. Holland away from his business and it is quite another affair. Then he is free to talk, to shoot, or to play golf, as you may desire.



MR. HENRY HOLLAND.

Mr. Holland exhibited a clever business capacity for grasping the situation when Mr. Jones brought out his patent try gun; he thought he saw the great assistance an adjustable firing gun would be in enabling him to fit sportsmen with guns suited to their varying requirements; so he at once bought the patent from Mr. Jones. This faith has been fully justified. The novelty of the invention has since been challenged (this generally happens with successful

entions); but this the great body of shooters did not know till after Mr. Holland had taken his benefit, as the sportsmen say. There is nothing like being first in the field. Since this try gun was invented Mr. Holland has patented an improvement which permits of another angle, or bend, being given to the stock, so as to allow of better lines being obtained where a good deal of "cast-off" is required in a gun.



MR. W. G. FROOME.

The memory of the try gun was revived when Mr. Holland took another step in advance by opening his extensive grounds as a shooting school, which he named "the Badminton," by permission of the Duke of Beaufort. This has been one of the firm's greatest successes, the grounds being fully engaged from morning to dark, and, from the first to use the tower, they were certainly first to put the clays over and through trees towards and over

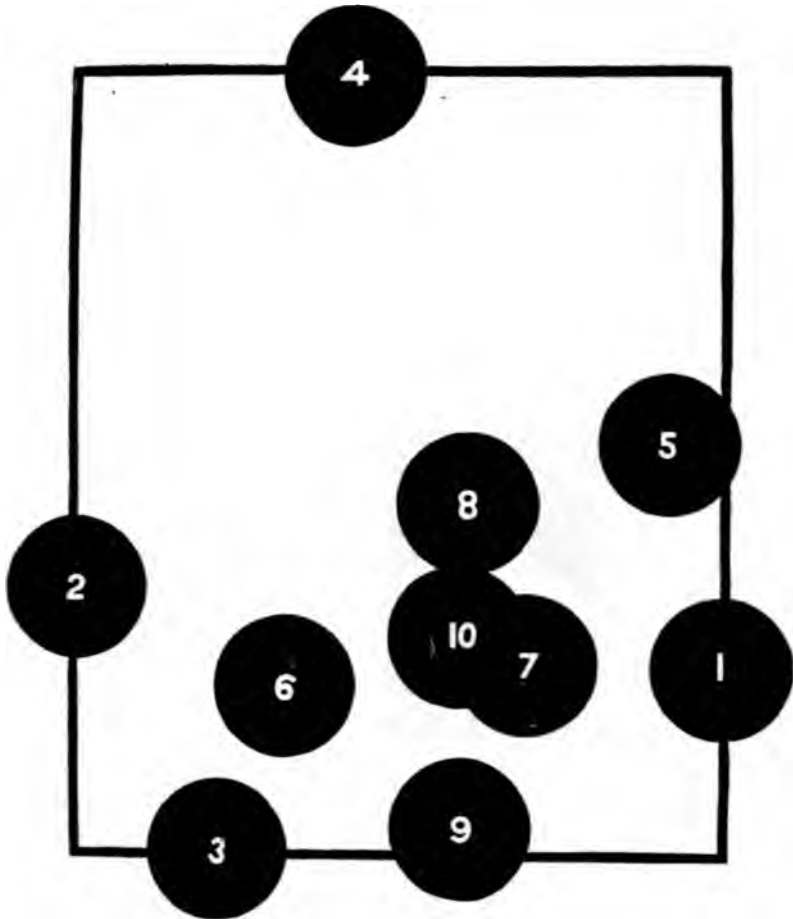
the shooter in imitation of rocketers and driven partridges. For practice, etc., they have many different kinds of targets to enable an expert to find out the faults in shapes of guns. What advantages sportsmen of to-day have over those of fifty years ago!

Again, Mr. Holland showed his judgment when he took up Colonel Fosbery's Paradox gun. This was the first attempt, we believe, to combine the merits of the choke-bore with those of the rifle. It has travelled far and wide since we were called upon to test its merits in 1886. That it is now as popular as we predicted it would become is certain. It is not, we think, generally known what a wide range of power this weapon has; it is equally good with snipe shot, buck shot, No. 6, or with bullets, and for this reason we think it well to quote our report of its performances.

Writing in 1886, we said: "At the invitation of Messrs. Holland, of 98, New Bond Street, we attended a most remarkable trial of their new double-barrelled gun, the 'Paradox,' at their range at Kensal Green. This gun is constructed to shoot any size shot, as well as bullets, out of the same chambers, and the plan devised for consummating this object they call the 'Paradox.' It consists merely of rifling about 2 in. at the muzzle, the whole of the remaining length of the barrels being smooth-bored. In handling, weight, and appearance the gun is precisely like any ordinary double-barrelled shot gun, except that it is leaf-sighted up to 300 yards. Colonel Fosbery is the actual patentee, and Messrs. Holland have developed and perfected the invention. Amongst those present to witness the trials were Captain Ellice, of the Grenadier Guards, who attended on behalf of H.R.H. the Duke of Cambridge, Commander-in-Chief; Dr. Tristram, for Colonel Fosbery, and some few gentlemen representing the leading London sporting journals. The reason, we believe, why the military authorities attended the trial of this new weapon was to ascertain whether such an arm would be suitable for use in cases of riot or analogous operations, where the object would be rather the wounding of individuals by the use of shot than of killing them with bullets, while at the same time the weapon used should be equally reliable in case the more deadly missiles were necessary.

"The 'Paradox' is made of various bores, but the weapon tried in the present instance was a 12-bore C.F., weighing 7 lbs. 2 ozs. We began operations about twelve o'clock; the sky was very cloudy, torrents of rain having fallen during the forenoon, and a few drops fell occasionally during the early part of the trials. A brisk wind

blew across the range from left to right, and the conditions generally would not be considered favourable to accurate shooting. Mr. Henry Holland conducted the trials, whilst W. Froome, who has for many years shot and regulated Messrs. Holland's rifles, and who is well known as a most expert marksman with sporting rifles, shot the gun in the first instance.



12-BORE PARADOX DIAGRAM (ACTUAL SIZE) AT 100 YARDS.

FIFTY YARDS' RANGE.

Commencing at fifty yards with ball, and firing from a rest, ten shots at a cardboard target having a circular bullseye $3\frac{1}{2}$ in. in diameter, and using the right and left barrels alternately, Froome placed the whole ten on the bull. Six out of the ten were so close one upon the other, that it was somewhat difficult to discern each individual hit.

ONE HUNDRED YARDS' RANGE.

On proceeding to the 100 yards range, the wind was found to have freshened, but its direction was the same: a 4-in. square bull, painted on cardboard as heretofore, was now put up, and ten rounds were shot out of each barrel alternately as at the shorter range. The score was seven hits in the bull and three a little to the right, and the aim was taken dead on, no allowance being made for the wind; the diagram made by the whole ten shots in this instance was $5\frac{1}{2}$ ins. by $3\frac{1}{2}$ ins.

"Having so far proved the accuracy of the 'Paradox' for shooting bullets, it was next tried as an ordinary fowling-piece, or shot-gun, the usual sporting charge of 3 drs. and $1\frac{1}{8}$ oz. of No. 6 shot being used in the ordinary green paper cases, at 40 yards. Appended are the results of six shots in a 30-inch *selected* circle. R. and L. indicate right and left barrel respectively.

FORTY YARDS, 3 DRS. BLACK POWDER, $1\frac{1}{8}$ OZ. NO. 6 SHOT,
30-IN. CIRCLE.

R. 206	Pattern very even.
L. 194	Ditto.
<hr/>	
R. 179	Pattern fairly even.
L. 209	Pattern very even.
<hr/>	
R. 220	Ditto.
L. 170	Ditto.

FORTY YARDS, 3 DRS. BLACK POWDER, $1\frac{1}{8}$ OZ. AAA SHOT.
30-IN. CIRCLE.

"At Captain Ellice's request, a couple of shots were fired from the 'Paradox' with large shot: AAA was the size used. The charge fired was $1\frac{1}{8}$ oz. AAA shot, counting fifty pellets (which we personally verified) and 3 drs. powder. The pattern made was—R., 39; L., 36. An ordinary 12-bore *cylinder*, which was shot against the 'Paradox,' with the same charge, for comparison, made a pattern of—R., 27; L., 15.

"We need scarcely observe that for a double gun to make such excellent shooting as we have described above, throwing bullets with as much accuracy as an Express rifle and making as good a pattern as a good modified choke bore, was a circumstance which naturally made a most favourable impression on those present. At this point, as all the shooting had been done by such an expert as Froome, who

thoroughly understood the gun, it was suggested that someone else should fire a few rounds. Consequently, Captain Ellice fired two shots from the shoulder, at a 4 in. bull, at fifty yards, and made a hit close to the edge of the bull with the right barrel, and a bull with the left. We, shooting from a rest, were even more fortunate, placing both bullets in the bull. Later on, at Captain Ellice's request, we shot from the shoulder, as he had done, and placed the right close to the edge of the bull, and the left well in the bull. We each then fired at the 100yds. range, and made some very creditable shooting, which confirmed to our individual satisfaction, and to that of the spectators present, the remarkable accuracy of the gun. Firing twelve shots with ball at the 100yds. range, and placing eleven of them close to the lower right edge of the bull—the aim being taken dead on—the shooting being intended rather to demonstrate the regularity of the shooting than the correctness of the sighting, or of the individual marksmanship.

A FINE DIAGRAM.

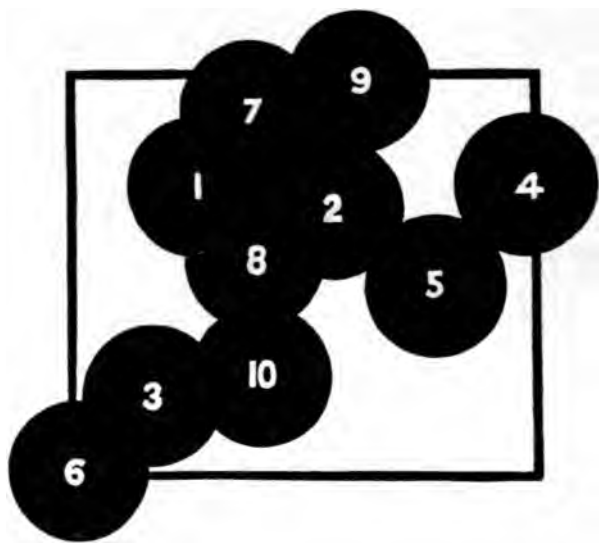
“As a gentleman who was expected, but who had been unable to attend to witness the trials, now drove on to the ground, Mr. Holland offered to have ten more rounds of ball shot at the 100yds. range, and Froome, in these ten shots, made a very fine diagram, placing all ten into $3\frac{1}{2}$ ins. by $4\frac{3}{8}$ ins. Nine of the shots were splendidly placed, as the diagram made by them was only $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in. Two rounds each were now fired with shot (3 drs., $1\frac{1}{8}$ oz., No. 6) at fifty and sixty yards, with the following results:—

R. 130, 50yds.	} This equals the pattern of a first-rate cylinder at 40yds.
L. 126, 50yds.	
R. 113, 60yds.	} This equals the pattern of a moderate cylinder at 40yds.
L. 117, 60yds.	

“Captain Ellice and ourselves subsequently shot spherical bullets out of an ordinary cylinder shot gun for comparison. Neither at 50 nor 100 yards could we place the bullets with precision. Their course was erratic, as it invariably is, and instead of placing them in something like an area of 4 inches square, as we had done with the ‘Paradox,’ it required a $2\frac{1}{2}$ foot area to embrace them. With regard to the shot patterns obtained, we were equally, if not more, gratified with the work done. Of the accuracy of the record we have no doubt, as we personally counted all the patterns made by the right hand barrel, while the counting of the pattern made by the left barrel was checked by Captain Ellice or one of the other gentlemen present. The circles were always selected, it is true, but they were nearly all good central shots. To prove the straight shooting powers of the gun

with shot, we personally fired a couple of rounds at a 30-inch disc, and made each time a perfect centre pattern, *quite as good as the best previously made in a selected circle*. A couple of rounds with No. 9 shot showed that the 'Paradox' could throw small as well as large shot or bullets. We would mention that a hollow-fronted bullet, weighing $1\frac{1}{4}$ oz., was the missile used in the ball shooting, the powder charge being 3 drs. A solid bullet may also be used, and for this a 4 drs. charge is necessary. The utility of such an arm as the 'Paradox' to sportsmen in India or the Colonies, where the game is varied, and where anything, from a snipe to a bear, may appear on the scene, is incalculable, for its accuracy and reliability are unquestionable.

"We have great pleasure in giving the diagram of the shooting at the two distances, the first one being the second diagram made at 100 yards, and the second one having been made at 50 yards."



12-BORE PARADOX DIAGRAM (ACTUAL SIZE) AT 50 YARDS.

It is not every successful shot with the rifle that can trust himself to make a diagram. Yet no man who cannot make a diagram, say of $3\frac{1}{2}$ inches at 100 yards, can shoot and regulate a double rifle. Every pair of barrels—or nearly every pair—that are laid together by an expert rifle-barrel maker have their own particular eccentric ways. By an accident they may shoot to the same spot at 100 yards, but it is far more likely that the two barrels will shoot from six to ten inches away from each other. Mr. Froome tells us that he thinks the barrel-maker has done wonderfully

well when he gets the two barrels to shoot as nearly together as six or eight inches. Sometimes the shots cross, that is, the right barrel shoots to the left and the left barrel to the right ; often they shoot wide, that is, the right to the right and the left to the left.

This represents the individuality of the rifle, and it has to be regulated accordingly. Mr. Froome, amongst many others, has tried to bring the measurements to such perfection in barrel-making that after-regulation should be unnecessary. He has taken down to the works of Messrs. Holland and Holland a double rifle that shot perfectly, and he has had others built to the same lines to the thousandth part of an inch by actual measurement. Yet, when these new barrels have come to the range to be tried no improvement over their predecessors has been perceptible, and they have invariably required the regular shooting and adjusting.

The regulation of double rifles is done in this way. The barrel-maker only brazes them together at the breech end ; the joining at the muzzle half of their length is by solder. This metal will melt when red-hot irons are put in the barrels, and this enables the barrels either to be wedged apart or squeezed together as required. This is done little by little ; and after every alteration the barrels are re-shot to see whether the required regulation has been attained. Mr. Froome is a most excellent man to carry out such trials. Two or three minutes, and a series of ten shots in his hands, determine the matter ; and the barrels are either finally regulated or else they are not, and have to go through more opening or closing up, as the case may be, and more shooting when that is done.

Attempts have been made by certain makers to bore double rifle barrels out of the solid piece of compressed steel ; but in Mr. Froome's experience these have not been satisfactory, as the barrels never shot together. Of course, when this is the case, there is no means of regulating the shooting, and the rifle is bad and unimprovable, as it is impossible to alter the lie of the barrels when they are one solid piece of metal.

Mr. Froome's method of shooting the rifle is exactly that

which he uses for the shot gun. He does not believe in military position, either with the right or left arm, and he thinks that many men, officers of the Army especially, shoot worse than they might if they abandoned the military position. The left elbow immediately under the rifle and the hand near the breech is, in his opinion, handicapping the man, so also is the high right-angle elbow position of the right arm. He believes in using a sporting rifle exactly like a shot gun, as regards position and getting the left hand well forward. He explains that quickness of aim is as necessary with the rifle as with the shot gun. In regulating a rifle, however, Mr. Froome invariably uses the rest, an instrument that renders the position of hands and arms of but little consequence for the business part of the work. This expert plater has won the Martin Smith at Wimbledon before now, and in the regulating of his rifles he tells us that he always looks to make a diagram of from three inches to four inches at 100 yards in everything except the big bores.

It is one of the advantages that the firm have in rifle-making that their customers can have the advantage of Mr. Froome's thirty years' experience, and can have their rifles made and sighted to their own requirements under his superintendency.

In conversation we were greatly astonished to discover that out of all the rifle shots who have passed under Mr. Froome's care, he only remembers about three who shot the rifle like himself—with both eyes open. He appeared equally astonished to hear that we did so. It is evident that much fewer shots do so than we imagined; probably we were misled by our own practice in the matter, although we have certainly known some good rifle shots that never shut an eye. We wonder what comparison the number of shots with the rifle (other than the rook rifle) fired by any sportsman and the number fired by Mr. Froome bear to each other. The former is lucky if he fires two or three shots at game every day for a few weeks in the year, whereas the latter is always at the target. It is not to be wondered at, therefore, if he is in a position to give some valuable hints to sportsmen. One of the most useful that he imparted to

us is this: Never trust your .303 with a nickel-coated bullet in a greasy barrel. If you do, it will shoot invariably high, varying from inches up to a foot. So that deer-stalkers who cannot "blow off" should be very careful to rub out every particle of dressing, of whatever nature, from their rifles before starting out.

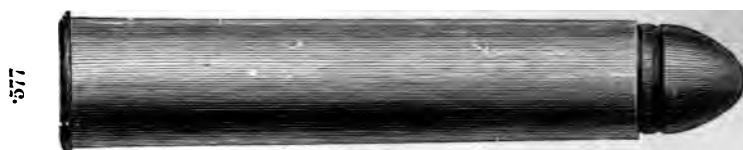
All nitro-powders are more liable to variation in strength than any black powders under the same conditions of heat, moisture, &c., besides being entirely dependable upon the composition of the cap. Mr. Froome has found that cordite has varied from some cause or other to the extent of several inches in the elevation obtained at 100 yards' range. This shows that one reading of a sight cannot always be relied upon. But it involves more than this, for when stronger powder or loading is put into a double rifle than that for which it was regulated, Mr. Froome has found that it has the effect of making the barrels shoot across.

The result of such a variation in powder as the particular instance spoken of would, therefore, be that the right barrel of the .303 would shoot a foot high and also to the left, whereas the left barrel would shoot a foot high and to the right. If, on the contrary, the powder fell below normal strength, the results would be low elevation and wide shooting instead of across.

Whether this result is by reason of greater expansion of the breech ends when more powerful powders are used, or whether it is to be attributed to the higher velocity of the bullet, is a matter of speculation.

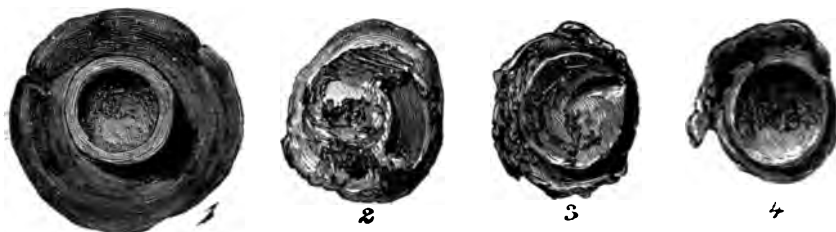
We cannot ignore the rifle trials conducted by the late Mr. Walsh, as no later trials have been held. The following measurements of diagrams are mostly obtained from the first London rifle trials therefore. The way we have tabulated these, and given the winning diagrams in inches, with the mean velocities, charges of powder, and weights of bullets, will we trust be of use. At any rate, there is a very great deal of information in a very small space. The energies of the bullets are at the distances stated. When no distance is mentioned they are muzzle energies, as well as muzzle velocities.

RESULTS OF THE PUBLIC TRIALS, LONDON, 1883, WITH HOLLAND'S WINNING DIAGRAMS.



577 Rifle Weight.		Velocity in f. s. with 164 grs. Powder, and 591 gr. Bullet		Energy in Foot Pounds.		Highest Trajectory in Inches.
11 lbs. 10 ozs.;	164 gr. powder, 598 gr. bullet	1,663	...	3,625 (muzzle)—		
26-inch	10 shots diagram, 4·8 by 6·3					
Barrel.	in., at 100 yards, winning	1,400	...	2,569	...	1·87
	10 shots diagram, 4·8 by 7·7					
	in., at 150 yards, winning	1,268	...	2,169	...	4·58

Rifle Weight,
12 11 s.
20/577



Sketches 1 and 2 are from bullets cut out of tigers shot by the late Sir S. Baker.
Nos. 3 and 4 from grizzly bears.



"577 bullet with copper tube."



"Small-hole bullet, giving increased penetration for big game."



.500 Rifle Weight.		Velocity in f. s. with 138 grs. Powder and 444 gr. Bullet.	Energy in Foot Pounds.	Highest Trajectory in Inches.
9 lbs. 1 oz. ;	138 grs. powder, 435 gr. bullet	1,784 ...	3,134(muzzle)	—
28-inch	10 shots diagram, 1·8 by 2·8			
Barrel.	in., at 50 yards, winning ...	1,641 ...	2,653 ...	—
	10 shots diagram, 3·0 by 3·4			
	in., at 100 yards, winning...	1,507 ...	2,237 ...	1·42
	10 shots diagram, 5·6 by 6·1			
	in., at 150 yards, winning...	1,382 ...	1,930 ...	3·58

Another form of Cartridge and Load.

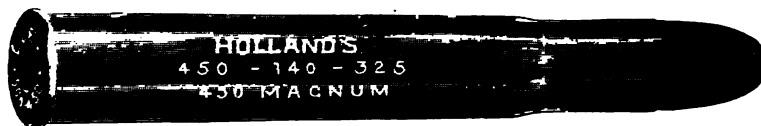


This bottle-shaped cartridge is also made to take a 500 gr. solid or hollow bullet, also a 570 gr. bullet.

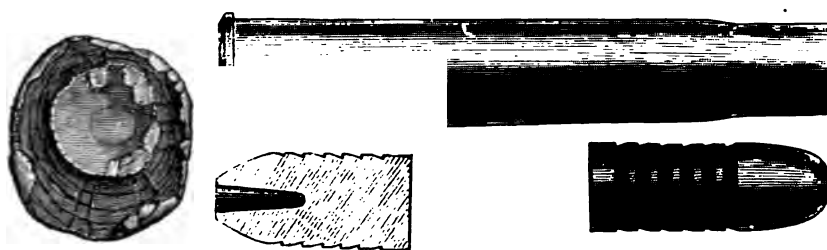
THE .450 RIFLE.

.450 Rifle Weight.		Velocity in f. s. with 110 grs. Powder and 332 grs. Lead.	Energy in Foot Pounds.	Highest Trajectory in Inches.
8 lbs. 4 ozs. ;	110 grs. powder, 328 gr. bullet	1,776 ...	2,254(muzzle)	—
26-inch	10 shots diagram at 50 yards,			
Barrel.	winning ...	1,618 ...	1,869 ...	—
	10 shots diagram, 2·9 by 5·4			
	in., at 100 yards, winning...	1,470 ...	1,544 ...	1·6
	10 shots diagram, 3·9 by 4·9			
	in., at 150 yards, winning...	1,335 ...	1,274 ...	4·12

Another form of Cartridge and Loads.



Rifle Weight.		Velocity in f. s. with 110 grs. Powder and 332 grs. Lead.	Energy in Foot Pounds.	Highest Trajectory in Inches.
Weight of 500 - 450 Rifle,	110 grs. powder and 375 grs. lead	1,702 ...	2,411 ...	Muzzle.
9½ lbs.	125 grs. „ „ 475 grs. „	1,445 ...	1,738 ...	100 yards.
		1,632 ...	2,812 ...	Muzzle.
		1,433 ...	2,168 ...	100 yards.
		1,122 ...	1,329 ...	300 yards.



Various Solid and Hollow Bullets before and after use.



Actual Size.

.295-bore, load 10 grs. powder and 80 grs. lead.

20 shots diagram, 1·2 × 1·2 in. at 50 yards, made without cleaning out, and winning.

Weight of 4-Bore Rifle.	4-BORE RIFLES.	Velocity in f. s.	Energy in Foot Pounds.	Highest Trajectory in Inches.
23 lbs. 8 ozs :	4-bore conical bullet, 1,882 grs.,			
24-inch	powder 12 drs. :			
Barrel.	At muzzle ...	1,330 ...	7,387 ...	
	At 60 yards ...	1,223 ...	6,244 ...	
	At 100 yards ...	1,160 ...	5,619 ...	27
	At 150 yards ...	1,091 ...	4,969 ...	682

Holland's, 50 yards diagram, 10 shots in 1·8 by 3·5 inches, was the winner.

„ 4-bore spherical bullet, 1,250 grs. lead,
powder 12 drs. :

At muzzle ...	1,460 ...	5,912 ...	
At 60 yards ...	1,224 ...	4,155 ...	
At 100 yards ...	1,099 ...	3,351 ...	27
At 150 yards ...	981 ...	2,869 ...	706

Weight of 8-Bore Rifle.	8-BORE RIFLES.	Velocity in f. s.	Energy in Foot Pounds.	Highest Trajectory in Inches.
17lbs. 8ozs. ; 26-inch barrel.	8-bore conical bullet, 1,257 grs. lead, powder 10 drs. :			
	At muzzle	1,500	6,273	—
	At 60 yards	1,357	5,135	—
	At 100 yards	1,272	4,511	2·22
	At 150 yards	1,178	3,870	5·61
	Holland's 50 yards diagram, 10 shots in 4·2 by 5 inches, was the winner.			
..	8-bore spherical bullet, 892 grs. bullet, powder 10 drs. :			
	At muzzle	1,654	5,232	—
	At 60 yards	1,354	3,505	—
	At 100 yards	1,193	2,720	2·20
	At 150 yards	1,038	2,069	5·90

It is perhaps hardly necessary to give particulars of the '360 or the '400 rifles, as the '303 and the '256 Manlicher have usurped their place, even if they have not hit all the Express rifles hard.

In the same way we find the 8 and 10 bore Paradox doing the work of the heavy rifles, and, in Mr. Holland's opinion, doing it better with about 3 lbs. less weight for the sportsman to carry.



Fig. 1.



Fig. 2.



FIG. 3.

- Fig. 1.—8-bore "Paradox" steel cored bullet, as described by Captain Swayne. "The bullet had passed obliquely through the rhinoceros, and was found under the skin on the other side."
- Fig. 2.—8-bore "Paradox" hardened solid bullet, fired at rhinoceros. "Entered at one side and came out at top of opposite shoulder."
- Fig. 3. 8-bore "Paradox" steel cored bullet, taken out of bull elephant. Mr. Digby Davies writes: "Bull elephant shot at 25 yards. Shot through the shoulder and found sticking in the skin on the opposite side. Animal dropped dead on the spot."

The 8-bore burns 10 drams of powder, and the 10-bore burns 8 drams.

Sir Samuel Baker speaks highly of the accuracy of these weapons, as also does Mr. Selous.



Ten drams of powder and 1,150 grain bullet.



Authenticated Target at 50 yards, $1\frac{3}{4}$ inches by $2\frac{1}{4}$ inches. This, it will be noticed, beats the winning 4 and 8 bore rifle diagrams recorded above.

In regard to the velocity and energy of this weapon, we do not know that it has ever been taken, but as the bore is the same, and the weights of powder equal and lead nearly equal to that of the conical ball 8-bore rifle, the table given above is near enough.

We have chosen to dwell mostly on Holland and Holland as rifle-makers, but it must not be forgotten that they make a speciality of cylinder bore shot guns, and it is mostly on account of this that their new factory, barely five years

old, has now, in 1897, to give place to a giant building in the Harrow Road, just at the junction of that thoroughfare with the lane leading to the Shooting School. About these guns we said some years ago in *Land and Water* that one of them had made the extraordinary pattern of 160 No. 6 pellets in the 30-inch circle at forty yards, in our presence. This was unusual, and the firm would not book any order demanding more than 135 or 140 pellets in that circle—at least not if choke boring were barred.

CHAPTER XXIX.

MR. W. P. JONES.

SOME remarks in the *Badminton Magazine* made by Sir Ralph Payne-Gallwey, to the effect that Birmingham guns were not fit to shoot with, were followed by the expression of a doubt whether Birmingham possessed the means to try the guns, even if the makers could build them. These statements have given rise to considerable ill-feeling, a fact that can hardly be wondered at. We observe that Sir Ralph has explained his meaning in the *Badminton*, withdrawing his censure from Birmingham guns to place it upon all guns held in stock by their makers, whether they happen to be London or Birmingham makers. The ready-made reach-me-down gun is the weapon that is now condemned, instead of only that proportion of this stock-in-trade which has been made in Birmingham.

That is, we fear, a somewhat unfortunate explanation. It practically condemns ninety-nine out of every hundred guns made in Birmingham, and an enormous proportion of those sold in London also. The fact is it is very dangerous to attempt to distinguish between a "reach-me-down" and a gun "built for me." Sportsmen have a habit of putting off giving their orders for guns until they come to London for the season, ignorant of the fact that, by this way of doing business, they give the makers no time to build especially for them between then and the 12th of August. Such, however, is the fact. And the result is that makers, whether of Birmingham or London, do not decline an order because they have no time to build to it. We do not say that there are no exceptions, we believe—nay, know—that there are. But the practice of the majority of makers, whether of London or of Birmingham, is to make a stock of

guns, finish them, and put them into stock against the time orders are forthcoming for new guns. They have to keep their workmen employed during the autumn and winter as well as in the summer. When these orders have been accepted, it depends entirely upon the time given by the purchaser whether he has guns built specially for him, or merely guns, that have been made in the winter, bent specially for him. The one takes months, the other only days to do. There is no bend, or cast, or length of stock, or weight of weapon that can be mentioned that one or other of these stock guns cannot be brought up to in a few days; moreover their pattern can be regulated to requirement in a few hours. We do not think Sir Ralph Payne-Gallwey would know whether guns were built for him or not. Provided he wished to see them in what is called "the soft" he could do so, for there are always plenty of reach-me-down guns kept in that state. What we wish to point out is that the fitting of the gun to the man is not necessarily done when specifications are laid down.

We have been informed, since this unfortunate opinion was given, that one of the London gunmakers, held up as superior to Birmingham workers in some former writings of Sir Ralph Payne-Gallwey, did, at that time, get the whole of his guns from Birmingham. This passage has been pointed out to us, and evidence of the fact has been offered to us. Had the writer been a little more amongst Birmingham makers he would have avoided such a slip as this. We only wish to emphasise our opinion that it is dangerous to generalise about gunmakers and their work. The quarrel is no business of ours, but since Mr. Allport brought the matter to our notice, we think it sufficiently a matter of interest to sportsmen to refer to thus far. Everyone has a perfect right to his own opinion, even if it should lead him to value Birmingham work more highly in consequence of its having been fraudulently sold as the work of a London salesman, and even if that salesman never built a gun or made a part of a gun in his life.

We are quite sure that Sir Ralph Payne-Gallwey did not intend to misstate the facts about the means of

trying guns in Birmingham; but unfortunately he does suggest a doubt, where there is no doubt whatever, about the existence of means of trying guns there.

Questions have been put to us as to whether these doubts are correct or not, and we were not prepared to answer them offhand. We knew that Mr. W. P. Jones had fitted up a ground earlier than either of the shooting schools in London had adopted the moving targets for gun fitting, but what we did not know was whether it was open to other gunmakers, and, of course, the point turned on that—unless there were other grounds that we knew nothing of belonging to the various gunmakers. What we found was that Mr. Jones's ground was open to any of the gunmakers; [we saw some of the bills for its use, proving that it is very extensively patronised by other manufacturers]; that it existed before anything of the kind in London; that it has various appliances that do not, as far as we know, exist in London; that it is nearer to the gun factories of Birmingham than the public grounds of London are to the London shops, for it is but a ten minutes' drive or steam tram journey, and five minutes by rail will do it.

The ground is of small extent, but nevertheless has a range of 500 yards. We have no hesitation in saying that for the business of gun fitting there is nothing better, if as good, anywhere. Birmingham, moreover, possesses its forty-yards ranges, close to the factories, in every case that we know of. In this respect it has a great advantage over London with some few exceptions; but that is not the point challenged.

Shooting schools have been described so often by us that we had no intention of describing this one, but the arrangements are different to what we have seen elsewhere, and, therefore, we will shortly describe it. There are to begin with the usual clay-bird traps, and besides the ordinary use of these there is a metal "bird," whose feathers consist of a coating of lime blue. This "bird" is not intended to break, and the only response he makes to the impact of the shot is to puff off a considerable little cloud of this blue smoke-like substance. Personally we like these

"birds" better than the clays, as it is distinctly more like making the feathers fly, and a quick right and left at the same "blue rock" resulting in two little clouds of "blue feathers" left in the air gives a distinct feeling of satisfaction to the shooter--at least, it did to us. I am inclined to think also that these metal "blue rocks" maintain their pace better than the clays. In any case, from their weight, they ought to do so, and, therefore, pertain more nearly to the flight of game. Another practice "bird" is called the snipe. He is thrown by a sort of catapult arrangement, and is also a "blue rock," emitting blue smoke when struck by the shot, which does not injure these "birds" either. This is the most simple arrangement we have seen for practice, and we imagine must be very cheap to buy; moreover it is much quicker and easier to work than the clay-bird traps are. There is the ordinary tower for throwing "the birds" overhead, by far the best way of using them in our opinion; and Mr. Jones had fitted us with a gun so well that we were fortunate enough to break all the singles and all but one of the double rises. But this practice is not exactly gun fitting. Before us, at forty yards rise, are five targets, arranged similar to the five traps at live pigeon shooting, only wider apart. This makes the disappearing birds more of a surprise than when they are all near together on the same target. This is the way they have of telling how a gun comes up for a quick straight-away shot. If this is satisfactory, the next step is a crossing bird, and this is far and away the best thing we have seen anywhere. It is a black pigeon-shaped bird on a white ground. The usual arrangement is for the bird to fly across the face of a stationary whitewashed target, and the disadvantage of that arrangement is that it is impossible to tell, when you miss, exactly where the bird was when you shot. That is, you cannot go to the target and fix the position of the bird in respect to your shot. Here you can, for the target goes along with the bird, and you can tell exactly where you shot for the object. Similar birds to this one have diagonal courses, and just as you are expecting one of these "driven birds," a rabbit darts out of a hole and bolts into another one, with your belated shot stir-

ring up the earth where he once was. These rabbits are quite a feature in Birmingham, for we saw a similar arrangement at Messrs. Westley Richards' private ground. The difference between them is that whereas Mr. Jones's rabbits are as erratic in their movements as an ordinary live bunny, the Westley Richards' rodent endeavours to save his life by pace alone. When he is hit he goes over, whereas you have to go shot pellet hunting to see whether you have been deadily at Mr. Jones's ground. This ground of Messrs. Westley Richards' is reserved for the firm, and for the Egbaston Gun Club. Here they have vanishing birds, try-guns like Mr. Jones's (the inventor), clay-bird traps, and the constant running rabbits described, besides the usual tower. Mr. Taylor, the Managing Director, very kindly exhibited everything to us in order to demonstrate that Birmingham was not behind London.

Mr. Jones is an inventor who has tried most things. Indeed we are not sure that he knows himself how many ideas he has worked out, wholly or in part; but when he claimed to have discovered the Robertson three-pull system and then forgotten all about it for years, there is no room for doubt whether so prolific a genius should be allowed to invalidate other and later claims, by reason of accidents that he did not himself see the merits of when they were done. But patent laws would not be worth a snap of the fingers if this could be done; and it was in no spirit of hostility to the inventive ability of Mr. W. P. Jones, who we highly respect, but rather in the interests of justice, that we wrote as follows upon receipt of the startling information:—

“A single-trigger action of the year 1883 has been described in the April 1898 number of *Arms and Explosives* designedly, as we understand the editorial summing up, to invalidate by means of anticipation all those later patents which have been sealed since.

“If this be the intention, it is curious to note that the *Arms and Explosives* description of the history of the gun and action points the other way. It is stated that Messrs. J. G. Bentley and W. Baker, of Birmingham, put in a provisional patent in 1882 for a single-trigger gun which they afterwards abandoned as useless. In 1895 the same Mr. Baker joined with that well-known inventor Mr. W. P. Jones in

patenting an improvement on the Bentley-Baker gun, in which they say 'in the said Bentley and Baker's mechanism both barrels, when loaded, were liable to be simultaneously discharged in the act of firing the first.' The gun, therefore, put forward as of 1883 make, and which *Arms and Explosives* says was not patented because it was thought to be covered by the 1882 patent, comes before the public condemned by its maker: inasmuch as it was covered by the 1882 patent, and that this patent mechanism would not work, that is, according to one of the patentees' 1895 statement. It is said, we do not know upon whose authority, that this gun was totally forgotten until it accidentally turned up for repair a short time ago, and that 'it has worked as a three-pull single-trigger gun ever since.' We think that it would be quite possible to discover an old flint-and-steel and to make it work as a three-pull single-trigger ever after: but what that would have to do with the validity of a patent is not too obvious. Nay, we have ourselves a three-pull pocket-pistol, and we pull before lunch, at lunch, and after lunch. We should imagine that Mr. Baker and Mr. W. P. Jones must have been grossly misrepresented, and that this 'story of the prodigal gun and the fatted calf, of anticipation of patents, or of a cock and a bull and a sovereign,' either requires to be re-written or decently buried.

"It may be that it is claimed for the gun that it not only worked as a three-pull gun ever after rediscovery, but even before, and that it was made like that. This seems to be the context suggestion, although it is not what is said. We can well believe that extraordinary things have taken place in gunmaking as they have in sport: sometimes, perhaps, too extraordinary to tell. That reminds us of an experience of our own which we may tell, as it conveys a moral, and perhaps will adorn a tale as well. We were more confidential than is our wont when it happened, and to an ancient and tried friend who we knew would believe every word we said, we whispered low, that which we have never dared to put in print. It was an extraordinary lucky shot: that is all. A stag into which we put a bullet with the 100-yards sight up galloped away and stood to look. Then with the 200-yards sight up we put another bullet into him, and he rolled over dead. Upon examination we found that there were only three holes in him instead of four: and, upon remembering his position, we discovered that both our shots had entered the same hole, the one having passed out at the neck on the off side, and the other at the flank. Our sage friend remarked that he saw nothing wonderful in the performance, and then he seemed to gaze into futurity for a time: at last he startled us with the remark that the story was too good not to tell, 'only,' he added, 'for the sake of your character for veracity turn the beast round, and everybody will

believe you.' 'Why,' we asked, 'that would be more extraordinary still to hit a beast in the neck and flank, and for both bullets to meet at the point of exit behind the near shoulder.' 'So it would,' he replied, 'much more extraordinary, but from what I know of the jury of public opinion your veracity will never be questioned if you turn the beast round: whereas if you insist on telling the whole affair your character for truthfulness will perish past recovery.' Now, as we would rather be truthful than be merely thought so, we had to invent a compromise, or hold our peace: and we, therefore, exhibited the skin to our best friends with its three holes. 'Ah,' said everyone, 'you were lucky to get him with such wild shooting as that; why the shots are at least a yard apart.' Everybody has not experience to fall back upon: everybody, like Horatio, does not dream in their philosophy what strange things there are on earth. And for the unwise this friend's advice was admirable if the story had to be told.

"*Arms and Explosives* have acted on the same principle in regard to the Jones-Baker gun as our friend advised us, and have told the story as the man in the street will readily believe it: not in the manner that would damage for ever the character of the principals, in the matter of veracity, before a jury of public opinion. It is more extraordinary as told; that it should be a three-pull single-trigger after it came back, is much more extraordinary than the simple truth, very possibly; but it is clearly the story that any man may swallow without straining himself in the least; because it will create no envy, just as our beast, when our friends had turned him round to their own satisfaction, created no envy, and was not a bit more extraordinary than the man who broke the bank of Monte Carlo."

CHAPTER XXX.

LANCASTER.

MR. H. A. A. THORN (Charles Lancaster) succeeded to the business of the late Charles W. Lancaster in 1878, when the latter died, and the business of Alfred Lancaster (brother to Charles) also fell to Mr. Thorn by purchase in 1890.

It may be thought superfluous, if not impossible, to attempt to extract more information from the author of "The Art of Shooting" than has been provided for the reader in the five editions of that book. We hear that this shooting educator is being greatly sold in America, and will shortly be published in the French language.

But it is not the "Art of Shooting" so much as the art of gunmaking that we want to sound Mr. Charles Lancaster upon. We want to enquire his views of the .256 and .303 oval-bore doubles that he has been turning out. He tells us that he has got excellent shooting from both, and is prepared to guarantee at least equal accuracy by his oval-bore to any that can be obtained from any method of rifling whatever. He does not make military long-range rifles at all, but tests these small gauge oval bores at 500 yards, which is certainly an exceedingly long range to test a sporting rifle at. Mr. Thorn abandoned several military inventions and patents of his predecessor when he took the business. Amongst these was a patent gas-check, designed to prevent the wobble of the ball as it was forced up the barrel. This inventor was a genius as well as an artist in gunnery. His father had started business for himself in 1826, after being barrel-borer for Joe Manton for many years. It is well to note that that extraordinary enthusiast Colonel Peter Hawker remarked of him:—"Lancaster, who has raised many gunmakers to the head of the trade by allowing them to put

their names to what was his work in all essential parts of the barrels, has long since started for himself. This I advised him to do if ever Joe Manton retired, and I anticipated that he would, sooner or later, be entitled to do so. I may now safely say that no man stands before him." Certainly no man stood before his son either. The metal gas-check was a most ingenious invention, and we believe that it is still in use in big guns. It consisted of two rings of copper placed round the envelope of the bullet, one at the base and the other towards the forepart, and so arranged and connected



THE LATE CHARLES LANCASTER 1826-1845.

by the envelope that when the powder gas acted upon that one at the base, it pressed upon the envelope, which, in its turn, pressed upon and expanded the front check, so that there were two rings round the projectile, the one in front and the other in the rear, that took the grooving, which between them kept the projectile from wobbling. In fact, the inventor's instruction to his patent agent (expressed in forcible language that we must decline to repeat) was based on a freedom from this then prevalent feature. Another device of his was the side-sighting arrangement for long-

range rifles, a device that the Government have lately revived for the Enfield :303.

The accelerating twist was in use by this firm in oval-bores prior to 1851; in fact, the same man who rifled these barrels for the late Charles Lancaster does it now for the present proprietor, Mr. H. A. A. Thorn. Forty-six years of rifle-boring in the same establishment is Mr. Carol's record.

Mr. Thorn thinks that a small bore is necessary to a battery for nearly all foreign sport as well as for deer-stalking



THE LATE CHARLES WILLIAM LANCASTER—1845-1878.

in Scotland. He recommends the :256 or :303, along with a Colindian shot and ball gun, and a :577 express. He points out the advantage of having a powerful rifle, ammunition for which can be obtained in any part of the world. He thinks that a small-bore should put considerably more shots into a 12-inch bull at 500 yards than out of it.

Mr. Thorn is a great believer in the oval-bore. He declares that there is nothing to wear out, no sharp edges to wear down, and he thinks that where there are sharp edges every shot is doing something towards wearing out the

barrels Mr. Thorn was desirous of competing in the *Field* rifle trials, 1883, and entered, on the conditions at first put forth, that a mechanical rest should be used; but he withdrew when it was found that no machine was good enough to rely upon, and that the test shots were to be fired from the shoulders of competitors. This he thought to be a competition of rifle shots, and not a test of rifles. He maintains that he (and probably other first-rate gunmakers also) can go to the ranges and satisfy any possible customer as to the shooting of his rifles. He declines to admit that either he or any man can guarantee to make a series of first-rate diagrams, or even shots, into a 3-inch bull at 100 yards; but that when an occasional shot is out and goes to spoil a diagram, it is the fault of the man and not of the rifle. Mr. Thorn has observed one curious difference in the action of the various powders. That is, that they give characteristic diagrams of their own out of the same rifle: thus the diagrams of the Cordite powder will vary from right to left, that is, a horizontal variation, whereas the equally good diagrams made with the same rifle using Rifleite powder show a vertical variation. This applies to all small-bore high-velocity rifles.

Mr. Thorn reminded us that he was the first man to say to us that he could see the shot when coaching a man in shooting. This does not mean merely that he can see where the shot strikes the ground near to the object, but that he sees the passage of the shot against the blue sky. We have before now recorded our experience in this matter. At first we could not credit the truth of the statement. We can safely say that having been a game-shooter for thirty-five years, we never saw our shot against the clear blue sky: and, moreover, we do not think that anybody ever did. Yet the very first time we looked for the little dust cloud of shot from the gun of another we distinctly saw it, and have found it easy to see ever since. The value of this sight of the shot in the business of coaching shooters it is not possible to overrate. It is necessary to see where the pupil shoots in relation to the object aimed at before the teacher can discover errors in method, let alone attempt to correct them.

We have had no experience of Mr. Lancaster as a coach, but as he has taken as many as 500 cases in a single year, it is not for the want of practice if he has anything to learn in this direction. He claims that in reality his was the first shooting school in London, although it is still known only by the name of a gunmaker's trial ground, and he tells us of many instances where his predecessor coached pigeon shots to success. Of course there was plenty of coaching before the days of shooting schools and moving targets. The question is whether the try-gun and the moving target have not filled a want. Mr. Thorn admits the use of the try-gun, but declares that he does not want it, and only uses it because it is the fashion. This fashion, by the way, is probably the result of the rush of the age. Nobody has time nowadays to take things leisurely. The business man who has made his pile takes his moor first and learns to shoot afterwards. He wants to be coached in the art while his first pair of guns are being built for him. He has no youthful experience of potting small birds and unsuspecting bunnies, and by slow degrees taking more and more off the rocketeer's tail, until at last the bird itself is actually in danger. He wants to learn his errors with the gun like he checks his clerks' accounts, and put his finger on a mistake at once. Perhaps it is the best way to learn to shoot, but we are old-fashioned enough to have some doubts as to whether it is the best way to become a sportsman. Perhaps that which is learnt easily and in a hurry is appreciated the less in the end.

Mr. Thorn believes in the two-pull single trigger, of which he has a patent, instead of in the recoil-actuated third pull. He thinks that if a man does by chance fail to release the trigger, and so becomes unable to pull again, when he finds this out and does release it and pulls again, the discharge should take place. But, as a matter of fact, it does so whether the system is the two-pull or the three. Theoretically, this would depend upon whether failure to release the trigger took place after the recoil-actuated pull, or whether it prevented this involuntary movement from taking place at all. We cannot say that we have been able to prevent



Double Barrel Breech-loading "Single Trigger" Hammerless Ejector Express Rifle. Smooth Bore Rifling. Made by Charles Lammont.



Double Barrel Breech-loading "Single Trigger" Hammerless Ejector Express Rifle. Smooth Oval Bore Rifling. 450 by Charles Lancaster.

this recoil-actuated pull in any case. Doubtless we could refrain from releasing the trigger after the involuntary recoil-actuated pull; but to say this is not material to the issue, and is equivalent to saying that we had no intention of discharging the second barrel. As is well known, the recoil pull is made by the rebound of the gun from the shoulder after the recoil has taken place. Mr. Thorn thinks that the shoulder being a factor in the necessary movement, and shoulders differing as much as the various men they belong to, it follows that the three-pull system may go wrong sometimes as a consequence. He thinks that in the .256 and .303 rifle, with which there is practically no recoil, this involuntary movement is problematical. We shall leave those interested in the three-pull system to declare their views on this point; for ourselves we can only say that we have not found the fault suggested, but then our experience with single trigger .256 rifles is very slight indeed at present, although with single-trigger shot guns it is not.

Mr. Thorn considers the pull of the lock and general handiness the most important points in a shot-gun; the latter term he defines as balance and proportion, or relation of one part to the other—an inadequate definition: but exemplified when a $6\frac{1}{2}$ lb. gun feels only like six pounds in the hand. We asked Mr. Thorn whether he does not think quick recovery a most important point in a scatter-gun. We pointed out to him how many more birds you can “get on to” if your gun is not loaded, and you are merely practising “drawing a bead” on the driven game, than you can get on to, in similar time, when actually shooting. Even if you are aiming only with a walking stick it is wonderful how easy it is to cover three or even four birds, all in good time, as they glide by in a compact covey. Mr. Thorn assents to this view, and believes that various powders make a good deal of difference in this matter: the quickly-ignited powders are, he thinks, an advance in this direction. Their recoil takes place while the muscles are engaged and contracted, and not after relaxation, when the hand is beginning to direct the finger to the second trigger, as in a slower igniting powder. Moreover, he

believes that the single trigger enables a quick recovery compared to that possible with two triggers. He points out that in changing triggers there is not merely a release of the trigger, but that the whole grasp is shifted at the moment when recoil, or reaction from recoil, is taking place, and he thinks that when this grasp can be retained recovery of control of the gun after the first discharge will be materially quicker. We are not recording our own opinions, or we might enlarge on the difference in recovery between a smooth-shooting gun and one that jumps and kicks over much.



MR. H. A. A. THORN [CHARLES LANCASTER SINCE 1878].

Mr. Thorn tells us that the firm of Lancaster was regularly building guns to make 140 pattern in 30-inch circles twenty-seven years ago, before choke-boring was heard of, and he reminds us of the wonderful pattern of over 300 No. 7 shot on the Gun Club three-foot target, made by Tommy Lant's gun. There is no doubt that some Lancaster guns did make patterns of 140 to 150 with the regulation charge of No. 6 shot on the 30-inch circle at that period, and we have no means of denying that it was a pattern commonly obtained, simply because we never had used

Lancaster guns at that date ; but we can say that if it were so—if Lancaster guns did this wonderful pattern—then there were few to equal it, and none that came our way, although we personally (but not then as editor of *Land and Water*) had made a special feature of trying the handiwork of most London and Birmingham makers as early as that date.

That Lancaster builds a beautiful gun now we are perfectly aware, and that the shooting and handling of them is all that can be desired is a fact within our own knowledge. The appearance of one of the Lancaster oval-bore rifles is illustrated by two reproductions, about which we need make no remarks, but allow them to speak for themselves. Mr. Lancaster is as proud as any other artist in London of his work, and he looks on a younger generation in the hope that in a few years they may assist to carry on that high reputation that has existed for three-quarters of a century at 151, New Bond Street.

Since these remarks first appeared we have had a serious difference of opinion with Mr. Lancaster on the question of short cartridges. We will add nothing in this place.

CHAPTER XXXI.

JAMES PURDEY AND SONS.

THERE is no gunmaker personally better known than Mr. Purdey ; there is none less written about.

There are two ways of advertising a business or a reputation. The one is positive and the other negative advertising. One or other is absolutely necessary to a gunmaker in these days of high pressure and competition. Positive advertising consists of paying for the insertion of trade advertisements in newspapers ; negative advertising proceeds merrily enough when your customers believe that you do them a positive favour to take their money and to build them a pair of guns in eighteen months or so, and that you can under no circumstances, and for no inducement of ready money, be induced to proceed with a new order in a very much less period of time. But, as a matter of fact, this is an exaggeration, as usual with reports, for Purdey can always make a pair of guns in from six to nine months, so he tells us, but he explains that it is unavoidable that orders should sometimes take what may seem to be an unnecessary length of time to execute. In some years the demand for his guns rises considerably over others ; this state of things cannot be provided for, since the guns have generally to be made throughout to order. Mr. Purdey cannot increase the output suddenly if the quality of the work is to be maintained. Such increase can only be made gradually, as it has been made in the past ; for the workshops are quite full, and the output increases annually. Mr. Purdey can only execute orders in rotation with all the dispatch possible to good work, and whatever customers may say or think to the contrary, there is no intention to make an advertisement out of the length of time required

to make a gun. Nevertheless the fact remains that it is a sort of advertisement incidental to a demand up to the capacity of the output. Both methods of advertising cost money: the one as outgoings, and the other in turning away upon occasion. Both bring in incomes out of proportion to their cost. The negative system requires several qualities in the man, such as every gunmaker does not possess. First, a big bank balance, which makes his orders to-morrow better than one to-day. Second, numerous leaders of shooting fashion for customers, who will decide how badly they have been treated in the matter of having to wait for their new guns. Third, absolute self-confidence, which assumes and believes that they will wait. Fourth, a business pride, which insures every man's little weaknesses being subject to as careful study as if he were the Prince of Wales. Fifth, a splendid judgment about guns. All these qualities Mr. Purley possesses: and possibly no other gunmaker possesses every one of them. It takes several generations to place a business on a foundation of this kind. Mr. Purley found the business good; he did not make it, but he has enormously improved it. "Who is the next best gunmaker to yourself?" asked Colonel Peter Hawker, of Joe Manton, early in the century. "After me, Purley does the best work," was the reply. By which it is obvious that the active head of James Purley and Sons was not yet born when Joe Manton's death left the name of Purley at the top of gunmakers in England. Heredity counts for something, and if the first gunmaking Purley was a workman of consummate skill, his descendant has consummate skill in the selection of workmen. Some years ago Mr. Purley changed the nature of his business so far as to sell a second-grade gun at a moderate figure. If we may judge by what we have seen, there was no great demand for them. Men do not go to Purley because they want to economise: they go to him and pay his best price with the utmost cheerfulness, because they are well aware that by doing so they will have done for them all that the art of smoothbore-making can do. Mr. Purley not only charges the top price for his guns, but his cartridges are also priced at a figure beyond that of



MR. JAMES PURDEY.

the majority; and we have observed that some at least of his customers have such an absolute faith in their father confessor of shooting that they will miss like a schoolboy should they happen to borrow a dozen cartridges from a neighbour, so great is the effect of confidence.

We may explain upon this subject that a deal of trouble is taken with ammunition. Scarcely a day passes, we hear, in which the testing of the component parts of cartridges is not going on, and this results in much communication with the makers. The improvement of cartridges is a subject of constant study. Mr. Purdey tells us that the departments of the business are supervised to an extent quite unusual, but that the trouble bears fruit in a very satisfactory manner, for he has a very large trade among the most particular people, who look to him for the best, and his standard is bound to be a high one in consequence.

Mr. Purdey is asked to make one of many a shooting party, where he may safely claim that he is the worst shot ever so honoured. The best gunmaker and the worst shot in England, one of his fast friends is said to have called him. It is a reputation that no sportsman and every gunmaker might envy, but in this case it is an exaggeration. The standard of the sportsman in question must have been a high one, for Mr. Purdey has proved most useful at a warm corner even of quite late years, and he knows how to knock pigeons over from a trap as well as most men.

If a rival gunmaker first gave Purdey his reputation, it can be said with truth that his modern rivals confirm it. There is no man in the trade that is more respected for his work and for his method of business than Mr. Purdey is. During the unfortunate ill-feeling, now happily ended, between the Birmingham and London makers, the former have not uttered a word that could in any way reflect on the credit of Audley House and its owner. "You all combine to advertise Mr. Purdey by expressing your admiration of the man and your opinion of his work," we remarked to one of them. "An honest man must, or else say nothing," was the reply from a Birmingham maker of the highest repute: a remark that might teach many people to live and let live.

Another maker in the same town told us that every credit was due to Mr. Purdey for the way he conducted his business. It is hardly necessary for us to express opinions upon the workmanship turned out in South Audley Street, when rivals in trade are thus outspoken about it. Moreover, it would be hardly less than presumption for us to criticise the shooting or the handling of Mr. Purdey's guns as long as Lord de Grey and Lord Walsingham continue to use them with such remarkable effect.

There is, however, something in a gun totally distinct either from its shooting or its workmanship. It may shoot well enough, and its action may be good enough to wear out two or three pairs of barrels, and yet it may be nothing better than a blunderbuss for all that. These other qualities are usually comprehensively called style—that is, handiness and strength, the metal in the right place, and no lumber or useless metal anywhere. Style in a gun is the counterpart of quality in a racehorse—it is, in a few words, absence of lumber. This is not mere lightness in the hand. Lightness in itself is a good thing, but it is a very bad thing indeed if it can only be had combined with kick and jump. That Mr. Purdey's guns are truly sportsmen's weapons, goes without saying. We do not say that they would win in a competition, if it were possible to test them along with others for pattern, both in length and width of pattern; for absence of recoil; for penetration; for absence of jump. If we could take these measurements all at the same time (which cannot be done), we do not know whose guns might win, but we have an idea that Mr. Purdey's would be there or thereabouts. The testing of a shot gun is not thoroughly accomplished until a few hundred shots have been fired with it at all kinds of game. We say this because we have known instances in which the target has proved all wrong. It is perhaps lucky for Purdey that all the experiments with the shot gun have never evolved a target test for it, one more reliable than the game itself. If it had there is no knowing who might come out best; for nowadays there are many gunmakers whose handiwork defies criticism. The reputation of Purdey has taken nearly a century to build up. What we

mean by its being lucky for the firm that there is no accurate machine test possible is merely this, that a reputation that has been laboriously chiselled out of time would not willingly be exposed to the chance arrows of the many that would be ready to shoot for the prize.

Mr. James Purdey is now (1899) in his 72nd year, and came into his father's business when he was only fourteen years old. He worked for some years at the bench, and acquired practical control of the business by the time he was twenty-one. This seniority gives Mr. Purdey a position in his business that none grudge him, as well as an experience of the wants and fads of sportsmen that is unrivalled. His father had been in business early in the century, first in Princes Street, Leicester Square, and afterwards at 314 $\frac{1}{2}$ Oxford Street, where he removed in 1826, two years before the birth of his son. James Purdey, the elder, had a predilection in his later years for double rifles, and he spent a great deal of his time at his shooting ground. Many stories are told of his skill with these weapons, and of their accuracy. In those days rifles were, of course, muzzle-loaded—first, 16-bores, shooting 1 $\frac{1}{2}$ drams of powder and a round ball, and, later, 32-bores, using 2 $\frac{1}{4}$ to 2 $\frac{1}{2}$ drams and a short-pointed *conical* bullet, and they used to be tried at small plaster casts, made to resemble and called "butterflies." His son turned his attention to *larger* charges, and in the year 1859 made some 40-bores (about .500 in.), shooting 4 drams of powder, and a 50-bore (about .450 in.), taking 4 $\frac{1}{2}$ drams. These were really the first Express rifles, although the name was first applied to some he made with a rather less charge some time before. Later he made 70-bores (about .408 in.), and 100-bores (about .360 in.), shooting larger powder charges.

About this time he had a great deal to do with pigeon shooting, which had then become a fashionable pastime at the Hornsey Wood House, under the direction of the late Mr. Frank Heathcote, who first introduced the large handicaps. When Mr. Purdey thought his customers' chances were good he got them to practise with him, and so he contributed to their success, and this policy brought him some of the

best and staunchest of his customers, among whom many still survive.

Mr. Purdey will tell you that very early in his business career he began to make a specialty of fitting customers with their stocks. His father had had a gun with an alterable stock as far back as he could remember, and probably much further, but fitting had not been made such a study of as he thought it deserved to be, and that he henceforth made of it, with considerable success, so that for the greater part of the last fifty years a very large number of the best shots at home and abroad have been through his hands.

With improvements in weapons from time to time, James Purdey and Sons grew in business. They were the first to adopt Whitworth's steel for barrels. Purdey had a good many conversations with the late Sir Joseph Whitworth about the supply of rough tubes, which were at first made exclusively for him. Hammerless and hammerless-ejector guns were well-marked successes. Mr. Purdey never knew an improvement take hold so quickly and so firmly on shooters' fancies as the latter did.

In the meantime the lease of the old shops in Oxford Street had been bought by the Royal Zoological Society, so that Mr. Purdey had to look out for new premises, and the firm are indebted to the Duke of Westminster for granting the site of Audley House, in South Audley Street, which was built in 1882. Mr. Purdey does not regret the change, for the new situation is more convenient for his customers: at any rate his business has greatly increased.

Mr. James Purdey still personally superintends his business, though he cannot give ten hours a day to it, as he used pretty regularly to do. One of his sons has been in the business for twenty-four years, and is, therefore, well qualified to take his father's place in his absence, and another son is a good shot, and superintends the rifle-shooting, and gives great assistance. Most of Mr. Purdey's staff have been for a long time in his employment. He has, if not the oldest workman in the trade, probably the oldest in one employment. He is in his 90th year, in perfect health and

full faculties—a wonder—and has worked uninterruptedly for James Purdey and Sons since 1832.

The portrait we are enabled to give is from a painting by Mr. Archibald Stuart Wortley, exhibited at the Royal Academy in 1891, and is considered one of that clever painter's and good sportsman's best portraits.

There is no doubt whatever that Mr. Purdey has had the greatest experience of any gunmaker. None confess more willingly than he does how much any good maker must owe, and how much he does owe, to the crack shots he has had to satisfy, although he will tell you, too, that many a first-rate idea comes from the bad shots, so that good shots are sometimes greatly indebted to the ideas of their less smart fellow-sportsmen.

It is only by solving difficulties that improvement is made, and there is no one so well able to set difficult and useful problems to the gunmaker as the good sportsman.

Thus we think that it was one of Mr. Purdey's customers—Lord de Grey—who declined for years to use nitro-powders, or anything slower than No. 2 black. This was on the ground that the nitro-powders, then made, took such a long time to send their shot up to the game, and consequently more allowance was necessary. Later very much later this distance was scientifically measured by us, and then it was found that the shot took just twice as long to leave the barrel with the nitro-powders as with No. 2 black. Here was information that a customer had imparted to Mr. Purdey. It is such as only an excellent shot would have been likely to discover without the help of scientific instruments for the purpose. That fairly represents the kind of service a good shot may be to the gunmaker, pointing, as it did, to the necessity for a different ignition of the nitro-powders then in use. There is no doubt that the nitro-powders have continually been undergoing improvement since the time we speak of. Moreover, as the time occupied in the barrel was the result of slow ignition, the improvements made in primers have brought the nitro-powders near, and still nearer, to the quickness of the ignition of black powders, so that now some of them are

very nearly equal to No. 2 itself in the quickness of getting the shot under way. This is the case more particularly with some of the condensed powders. Moreover, it should not be forgotten that the process of hardening Schultze powder converts its crust or outside coating into a material similar to condensed powder. Here we have a crust formed by the dissolving of some part of the ordinary nitro-cellulose by ether-alcohol. It is easy to see that (every grain of the powder being enveloped in a waterproof crust) the improvement must have a great difference on ignition of the powder, especially in damp weather.

In 1894 Mr. Purdey induced Lord de Grey so far to abandon his conservative principles as to try Schultze powder, and this resulted in a complete conversion of faith, and he has stuck to the nitro ever since.

CHAPTER XXXII.

RIGBY.

THE appointment in September, 1887, of Mr. John Rigby, the well-known Dublin gunmaker and rifle shot, to the post of Superintendent of the Royal Small Arms Factory at Enfield, was received throughout the Kingdom with satisfaction and relief. It was thought that he was the right man to superintend the manufacture of arms he could use so well. His talent for both manufacture and shooting is hereditary, derived from two or three generations, the first of which was established as a shot and gunmaker in Dublin more than a century ago. He proved the truth of public opinion, and that he was eminently fitted to control the great Government establishment where the small-arms of the country were to be manufactured and entirely re-modelled by him. Amongst the most treasured relics of the grandfather of the late superintendent is a silver medal, bearing on one side the inscription: "Independent Dublin Volunteers, Reward of Merit," and on the other "Presented to John Rigby, March 25th, 1781, being the best shot in the Grenadier Company of Independent Dublin Volunteers." Another relic of this ancestor is in the form of a pair of silver cups, presented to him in 1816 by the contractors for small arms in Dublin, "As an acknowledgment of his exertions in the interests of the trade." William Rigby, who also carried out several Government contracts, succeeded to the business in 1819, and subsequently entered into partnership with his younger brother, John Jason Rigby. The guns and rifles of this firm were well known sixty years ago. The late Superintendent of the Royal Small Arms Factory, therefore, comes of a family in which gunmaking has been the occupation and rifle shooting the recreation for over a

hundred years. The present head of his family entered Trinity College, Dublin, at the age of sixteen, obtained honours in science, took his degree, and left the University to join his father, on whose death, in 1858, the business came exclusively into his hands. In 1860 Mr. Rigby invented and patented the method of forming cartridge cases of coiled sheet brass; this was adopted by Colonel Boxer four years later in the construction of the "Boxer" service cartridge, used for Snider rifles. Mr. Rigby made several futile attempts to obtain public recognition for his claim to priority in this invention, but his patent, nevertheless, proves its justice. In the earlier history of the N.R.A. it was customary to hold yearly a series of trials at Woolwich, to which makers of military fire-arms were invited to send their productions; the object being to select the best long-range rifle, to be placed in the hands of the sixty competitors entitled to shoot in the second stage for the Queen's Prize. In 1862 Mr. Rigby first entered these contests—in opposition to Whitworth and Henry. In 1864 Mr. Rigby again entered his rifles, his principal opponents being Whitworth, Henry, Storm, and Baker. In 1865 the superiority of Mr. Rigby's rifles over those of his opponents was demonstrated; and they were the weapons with which the second stage for the Queen's Prize was fired in that year; the weapons were afterwards presented to Sharman—the winner—and his fifty-nine colleagues. It should be mentioned that the fine sportsman and match rifle-shot, the late Captain Horatio Ross, used rifles of Mr. Rigby's manufacture thirty years ago, and it was with one of these that he won the Cambridge University Long Range Cup, in 1867, after two days' contest. Mr. Rigby has been selected to form one of the Irish Eight team twenty-eight times since 1864. In 1878 he led the Eight to victory with the highest long-range score ever made at Wimbledon (215 points) up to that time. Among his other trophies have been the Abercorn Cup (several times); the Wimbledon Cup (three times); and the Gordon Bennett Cup, won at Creedmore in 1877; the Irish Championship 1878–1895–1896.

It is not to be wondered at, therefore, that Mr. Stanhope sought Mr. Rigby's expert assistance to enable him to arrive at a safe decision on the recommendations of the Small Arms Committee, then, in 1887, in course of preparation.

The Small Arms Committee had at that time decided to adopt the .303 bore and the Lee magazine system, modified in various details of the breech action by the assistant works



MR. JOHN RIGBY.

manager, Mr. Speed. For the rifling, a design of Mr. Metford's had been finally adopted by the Committee, but without the accelerating twist for which this inventor's name had become noted. The service ammunition was still unsettled as to form and size of case, material of bullet and primer, and as to the kind of powder to be used.

It was feared at the time that smokeless powder could not give the required ballistics without an internal pressure in excess of that of black powder.

In 1889 a provisional cartridge, loaded with pellets of compressed black powder, was adopted, and the manufacture of the Mark I. magazine rifle was pushed on. Activity prevailed at Enfield in 1890-1891, the number of men



MR. E. J. RIGBY.

employed reaching 3,300, and the output rose to over 2,000 rifles a week.

Enfield was now for the first time provided with a chemical laboratory, for examining into the purity of the stores used, and with a 50-ton Buckton machine for testing the steel employed.

The manufacture of Maxim guns was undertaken, and .45 bore and .303 bore guns, with their mountings, are turned out in numbers.

The details of Mark II. Magazine Rifle were worked out, the pattern was reduced in weight, and the strength of the breech action was increased. Later a six-shot cavalry carbine and the Lee bolt action, modified by the addition of a safety bolt, was designed, approved, and manufactured to take the same ammunition as the rifle.

At first, after the adoption of cordite powder, the barrel of Mr. Metford's design would not stand more than 3,000 rounds at the outside. Maxim guns can fire 1,000 rounds through one barrel in a couple of minutes; consequently the whole life of a barrel could be exhausted very quickly.

To meet this defect Mr. Rigby introduced the pattern called "Enfield," and this has been found to stand from ten to twenty thousand rounds without losing serviceable accuracy. This "Enfield" rifling for machine guns has been followed by its general adoption for .303 calibre rifles.

Mr. Rigby's retirement during the time of the conversion of arms for the volunteers to a pattern which he originated is to be greatly regretted. It was due to the age rule, and was against the wish of the heads of his department. Mr. John Rigby is the proprietor of the well-known gun-making firm of John Rigby and Co., of St. James's Street, of which his son is manager.

He has closed the establishment in Dublin, and sold the goodwill of the local business to Messrs. Trulock and Harris, retaining the right to deal in London, where the firm not only sell their guns, but also manufacture them, with all his old Irish customers. The works are in Ham Yard. Mr. Ernest John Rigby takes the management in both places. The latter was for five years in the Birmingham Small Arms Factory. He takes a very great interest in the work, and personally does a great deal of the rifle sighting and shooting at the targets, a position for which he has proved his competence by winning the Albert Cup, and by shooting fourth in the Irish Eight at Bisley last year. We were somewhat surprised to hear that he is not so young as he looks, for he is just thirty-one.

The Rigby rifling for game shooting in the small bore .303 is the same as Mr. Rigby introduced in the Enfield rifle for the Government. The peculiarity of this is that the bearing surface and the grooves are equals in measured surface; each being one-tenth of the circumference of the five-groove bore, in place of the seven bearing surfaces of the Metford—each of which was but 3-100 of an inch, or one-fifth of an inch altogether. This principle retains all the high velocity, flat trajectory, and light ammunition; does not make the rifle heavier, but capable of so much greater wear that, as we have pointed out, it is now satisfactory for Maxim guns. Mr. Rigby thinks that the new Indian Government bullet may be regarded as the Tweedie bullet over again. He regards it as within the letter of the law of the Geneva Convention, but not within its spirit. That agreement was against the use of explosive bullets and not against expanding projectiles. It is not yet known what the decision of the War Office will be; but the Indian Government are very decided in favour of the new bullet, and it is well to remember that the Indian Government are independent in this matter, if they elect to be so. The principle is that part of the lead bullet is exposed and the envelope is thinned down in front. Mr. Rigby is of opinion that this bullet would not expand at 1,000 feet per second, and therefore men at a distance being hit with it would not suffer from expansion of the bullet. He does not think this principle likely to supersede the split envelopes for sporting purposes. On this subject Mr. Rigby, sen., informs us that he finds it very difficult to get a unanimous opinion from sportsmen, because of the difference of the sorts of game each follows, and the amount of split suitable for a soft-skinned animal would be greatly too much for an elephant or rhinoceros. The late Mr. Allport, the former manager at 72, St. James's Street, patented the split envelope. Mr. Jeffreys came with a complete patent in April, after the provisional of Mr. Allport's in January of 1893. Mr. Allport dying, both patents became invalid. The Tweedie 1889 patent was for weakening the front of the envelope, so that the present

split pattern should by rights be called the Tweedie-Allport bullet. The latest Government design for these .303 bullets is one which leaves a hole in the nose of the envelope up to which the lead does not quite come.

Mr. Rigby continues to give great attention to the shooting qualities of military rifles, and strongly advocated the change in the rules of the N.R.A. which has been recently made, confining the Bisley long-range competitions to rifles of calibre under .315. He points out that this rule is sure to bring to the front the most accurate rifle and the ammunition most effective with it. He used the Mauser .275 Spanish model (2,400 f.s.) with fair success at Bisley in 1896.

The Mauser Spanish pattern is a repeater which you can load singly. This arm weighs 8 lbs. 5 ozs., whereas the Dutch Mannlicher .256 weighs 9 lbs. We have taken occasion to sound Mr. Rigby on the possibility or probability of automatic rifles to throw out cartridge cases, cock themselves, and reload themselves. He believes there would be an advantage, but at present his opinion is that they are all too complicated for service work. For sporting purposes the firm are, besides their .303, now making singles, .275 and they are likely to make doubles, .256. They make .303 doubles down to 8 lbs. weight. Mr. Rigby thinks that the Gunmakers' Association has rightly taken up the matter of proof charges of these small bore rifles, because proof as applied does not test the barrel in the right place, and involves the use of more metal than necessary in those parts of the barrels where normally the pressures are very low. The proof bullet now comes in the barrel about eight inches from breech, the space between it and the breech loaded up with coarse grain powder. It is obvious that this renders necessary metal of considerable thickness for the first eight inches, instead of only near the chambers. Mr. Rigby believes a finer grain powder should be used, and a heavier bullet in order not to get less stress from proof, but to get it in the right place.

Mr. Rigby was one of the first to experiment with choke boring and to condemn full chokes for general game

shooting. He wrote a letter to the *Field* soon after their first introduction into England, advocating modified chokes, but the then editor declined to insert it. Nevertheless he remembers a shooter of the highest reputation in Ireland coming to him for choke bores, which, in spite of his reputation, he was never able to use with good effect. Curiosity then prompted Mr. Rigby to try the guns that had served to establish the shooter's reputation, and these barely averaged 100 in the 30-in. circle at forty yards, using No. 6 shot. From our own knowledge we can say that this was an excellent average before the days of choke boring, and that we knew of not a single gunmaker who could assure us of such good results; although we also know that occasionally better was done by them—more, we believe, by luck than cunning.

The Messrs. Rigby have just now brought out a single-trigger gun. This, like that of a near neighbour, has the principle of three distinct pulls. Mr. Rigby claims, however, that it will have an advantage over anything yet brought out, inasmuch as the release of the trigger will, compared with others, be of shorter play. This, he thinks, will be an important advantage to those newly taking to single triggers. We may remark that a newspaper was inclined to be satirical and to accuse us of “booming” single triggers when they first came out. All we have to say now about that is that “imitation is the sincerest form of flattery.”

This new patent single trigger will be known as the Rigby and Atkins. It has been thoroughly tested at game last season and approved.

Possibly no man has made so many experiments with the small bore rifles, .303, as Mr. John Rigby. His practical observations considerably modify theoretical calculations about trajectory and the “jump.” It is only a short time since we were reading some elaborate calculations, comparing the fall of the .303 bullet and that of the express at 100 yards. Mr. Rigby finds that the Lee-Metford or Lee-Enfield rifle does not drop its bullet at 200 yards, and shoots, therefore, higher than the line of the axle of the bore at 100 yards. The jump in this weapon is responsible

for ten minutes of elevation, whereas the Martini jumped downwards, and the Martini-Enfield has the same tendency also. It follows, as a matter of course, that the mounting of the barrel makes all the difference, and that a table, worked out from velocities and weights, giving variations of height of trajectory between the different borings and riflings, is likely to be absolutely worthless, except from a theoretical point of view, unless the value of "jump" in rifles of different mounting is first found. It is clear that every individual rifle of any particular pattern will have its own peculiar and particular trajectory governed at distances up to 200 yards, not so much by the

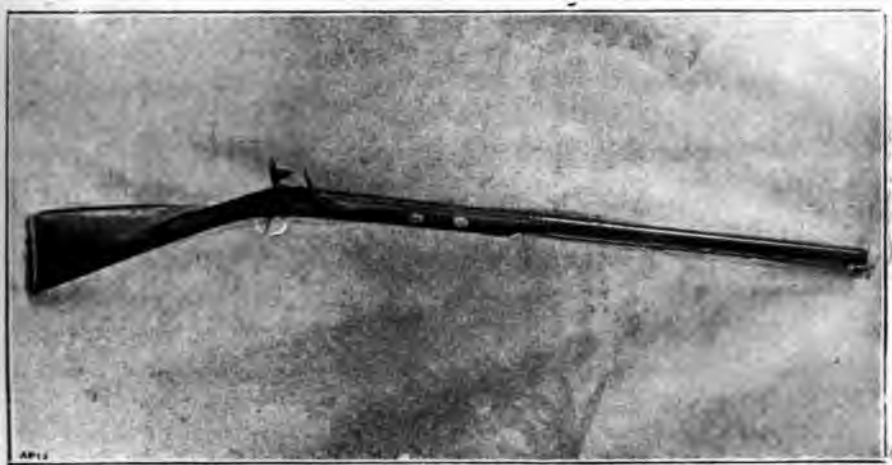


SINGLE TRIGGER DOUBLE-BARRELLED PISTOL OF 1848.

laws of gravity as by the incidence of "jump." In fact, each match or sporting rifle of these small bores that is turned out requires the individual attention of an expert rifle shot, and that is just what it can and does have from the firm in St. James's Street.

We give an illustration of a single trigger double pistol built by this firm about the year 1848. Single triggers as then made were useless for shot guns, because it was found that one discharge jarred off the second barrel. Some of the inventions of the last few years have quite obviated this difficulty.

Another illustration is that of a gun built in the 18th century, prior to the fame of the celebrated Joe Manton. It is, of course, a flint and steel, but the reason we have chosen to illustrate it is to show that the American bend did not originate in America, but was in all probability merely a survival of things as they were here at the end of the last century. English shooters have been schooled into the use of straight, long stocks, which twenty years ago were at the height of their popularity. There has been since more or less of a reaction. - Driven game and not pigeon shooting now set the fashion, and we fully expect that the reaction that has set in will go much further yet.



EIGHTEENTH CENTURY BEND FOR SHOT GUN.

At any rate, Mr. Rigby tells us that he has noticed a considerable reaction in this matter during the past few years. There was a great deal to be said in favour of straight stocks in the days of black powder and walking up game. The smoke absolutely prevented a fine sight being taken for the second shot, and moreover flushed birds are nearly always on the rise. How much it is quite impossible to see through a cloud of smoke. The elevation that the straight stock made compulsory was, therefore, distinctly good for the results of the second barrel. Now that there are not only so-called smokeless powders, but plenty of

absolutely smokeless powders on the market, the case is very different, and accuracy of alignment is as possible with the second barrel as it is with the first.

Mr. Rigby has given much attention to the qualities of the metal used for gun barrels. He has devised a method by which the strength and elasticity of the steel or iron may be tested with certainty before the forgings are made into barrels. This is described fully in the chapter dealing with Mr. Webley. This is very desirable, as hitherto very little certainty has existed on this subject. He points out that a much stiffer steel is required for '303 rifles and others, subject to pressures of over twenty tons to the square inch, than for shot gun barrels. In the latter toughness is of as much consequence as ultimate strength.

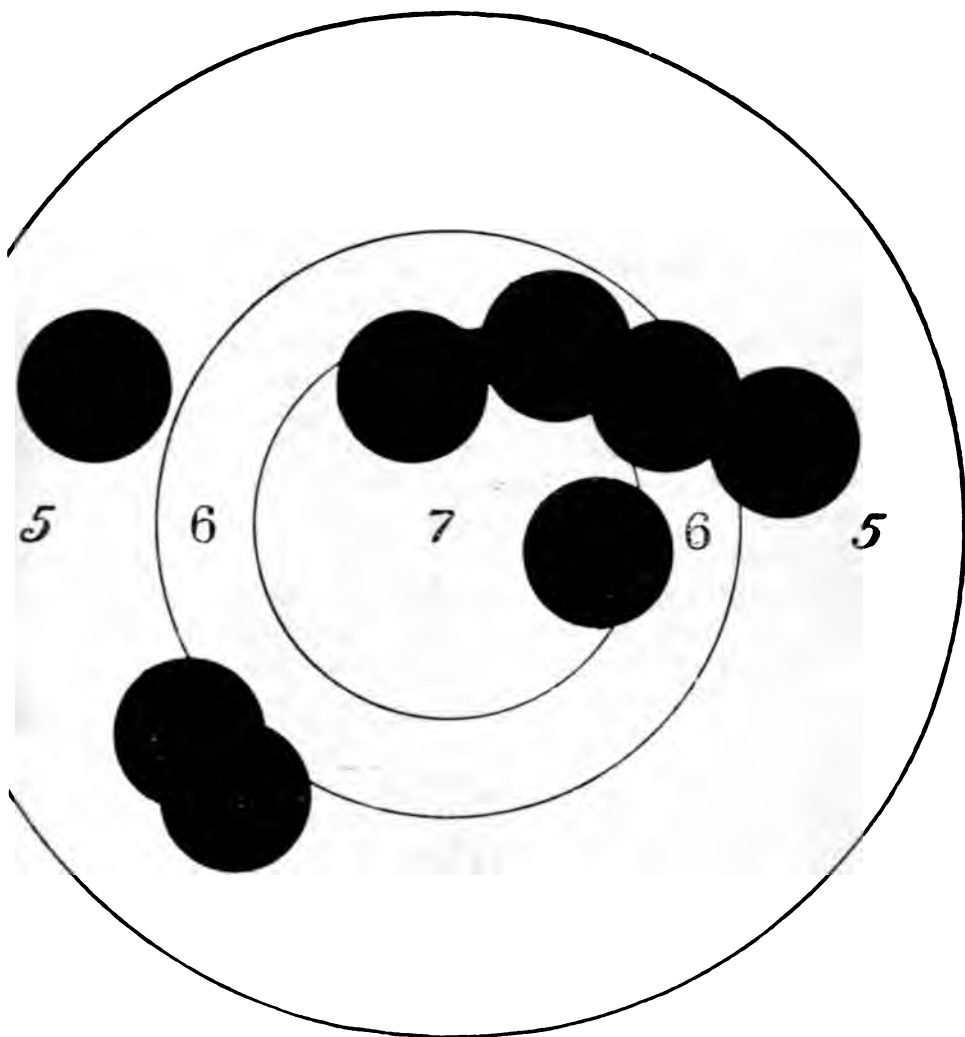
There is a great deal of difference of opinion about ~~which~~ is the best gauge and rifling of the various small bores. Messrs. Gibbs, of Bristol, have adopted as their own the Mannlicher, and, as we have already explained, they issue a beautiful little sporting rifle with Mannlicher barrels. In gauge the Mauser comes next in size, its gauge is '275, and Messrs. Rigby have become step-fathers to this foreigner on the assumption that it has some advantages over the '303.

THE MAUSER SPORTING SINGLE RIFLE.

Nobody could be better able to take care of the interests of a shooting invention than the two crack rifle shots who are usually to be found in St. James's Street. They cut down the ordinary Mauser barrel to 25 ins. in order to get a good balance for a sportsman's hand, and to reduce the weight to 7 lbs. The makers describe the weapon as follows :--

The construction is simple, very strong, and easily cleaned. Its parts are few in number, and can be dismantled and assembled without any implement. They are interchangeable. The stock, which has a pistol hand, is of English model, strong and well proportioned. The barrel is 25 ins. in length, and carries neat sporting sights for 100, 200, and 300 yds., and, when ordered, an additional sight graduated to 1,000 yds. It is also, when desired, fitted with a peep-sight of Messrs. Rigby's design, which can be set for 100, 200, or 300 yds., or pushed below the line of aim at will. "Penetration of covered bullet into

seasoned elm board, 1 in. thick, twenty-five boards: distance, 50 yds. Penetration of soft-nose bullets, five boards, holes much larger than the bullet, and fibres torn."



THE MARTIN-SMITH WINNING DIAGRAM MADE BY MR. E. RIGBY, WITH A BALL AND SHOT GUN. EXACT SIZE.

We have had a few shots with the weapon, and the pleasantness of the absence of recoil is undoubted. Our first shot was a bull, but the sun was too awkward on that

occasion for anybody to do anything like a record diagram. We are, all the same, perfectly aware that some wonderful shooting has been done at 100 yards by Mr. E. Rigby. A weapon of this sort has to be judged now for its handiness and the definition of its sighting, as all these small bores shoot well enough when held straight. But Mr. Rigby has extended the principle of high velocities to .450 bores, and we believe that he is the first to have done so.

THE NEW HIGH VELOCITY .450 RIFLE.

We have also shot this weapon, the accuracy of which is as good as one could wish, and we were astonished that the recoil did not in any way disturb our peace of mind. We expected the recoil to be proportionately increased by the excess of load beyond that of the ordinary .450 express. But the weight of this rifle with its 28-in. barrel is 11 lbs., and there is no doubt its recoil is less than the bigger bores of heavier weight and having the same energy of projectile. Thus an 8-bore of 16 lbs. weight, with a spherical ball and 10 drachms of black powder, has more recoil and about a similar striking energy.

It has three projectiles, any of which can be used as occasion requires, viz., 1st, solid nickel-covered, of 480 grains weight: 2nd, soft-nosed, nickel-covered, of same weight: 3rd, hollow-pointed express, partly nickel-covered, 350 grains weight. The same charge of cordite is used with all, and the accuracy and convergence of the right and left barrels are good enough for sporting shots without change of sighting.

The great advantage of a weapon of this kind over the big bores is, of course, besides its lightness, its adaptability to two or three different bullets with their different effects. Thus the solid bullet has a greater penetration than the 8-bore, whereas the soft-nosed bullet or the hollow-pointed will make a bigger wound.

The following velocities, taken by an independent witness, may be relied upon :—

Special cartridge cases, taper Express pattern, cordite charge, and bullets as under. Velocities taken by Mr. Knight (manager) at Messrs. Curtis and Harvey's mills, March 18, 1899 :—

Series 1.—Solid nickel-covered bullet, 480 grains weight, cordite powder.

Round 1	1970	|	Round 4	1982
Round 2	1964	|	Round 5	1985
Round 3	1961	|		

Mean o.v., 1972 f.s. ; muzzle velocity, 2059 f.s. ; mean variation of o.v., 8·5 f.s. ; muzzle energy, 4512·3 ft. lb., or more than 2 ft. tons.

Series 2.—Same cartridges, but bullets partly nickel-covered (nose uncovered), weight 350 grains, cordite powder.

Round 1	2052	|	Round 4	2075
Round 2	2060	|	Round 5	2100
Round 3	2060	|		

Mean o.v., 2069 f.s. ; muzzle velocity, 2205 f.s. ; mean variation of o.v., 14·4 f.s. ; muzzle energy, 3781 ft. lb.

The makers advertise the following results as obtained for penetration, and they are of course always ready to guarantee practically similar results.

Fired at 50 yds. into seasoned elm boards, 1 in. thick, the solid bullet penetrated twenty-three boards.

(a) At 10 yds. this was reduced to nineteen boards, as the head of the bullet was somewhat flattened and thickened by the increased velocity of impact.

(b) A bullet of same weight, but soft nose, penetrated (at 50 yds.) nine boards. The soft lead had been forced back over the cased part of the bullet, and some of it rubbed off. The holes in the boards were enlarged and ragged.

(c) An express bullet, hollow point, penetrated five boards only, but these were split and splintered in a very violent manner.

The ball and shot gun made by Mr. Rigby holds the record at a public competition, as Mr. E. Rigby won the Martin-Smith prize at Bisley with the extraordinary diagram illustrated, which we have had photographed the same size from the official target. This is a performance on which we may well compliment the enthusiastic shooters who conduct the business in St. James's Street.

CHAPTER XXXIII.

MR. WATTS AND THE LONDON SPORTING PARK.

MR. WATTS represents the modern change that has come to explode old ideas. Old sportsmen who have shot all their lives, as one of the necessities of the life of a country gentleman, may still, figuratively, turn up their noses at the mere idea of a London Shooting School, and may wonder why on earth a school should exist in a big city in order to teach that which they learnt satisfactorily to themselves in the country.

There is no hard and fast rule in shooting. Mr. Watts says we all aim at the same result—the game—but we all aim by different methods. There is not the smallest doubt that he is right. No two men can be more unlike than he and the writer of this article; but, although he is an excellent shot himself, he would never seek to make us imitate his own methods. Therein comes in the real expert—the man who does not diagnose a patient by feeling his own pulse. An expert is not a man who talks about his own shooting; he is not a man who, being a crack shot, thinks it necessary that aspirants must imitate him; but he is one rather who learns something from every individual shooter he watches and talks to—often, as Mr. Purdey once said to us, more from the bad shot than from the good.

Perhaps we may be excused for discussing at some length the difference of requirements between Mr. Watts and ourselves: in order to show that an expert has to recognise differences in individuals that he can have no fellow-feeling with himself. Mr. Watts is a left-eyed man. He closes, or partly closes, the left eye in shooting. We are so thoroughly the reverse that we never do so even with the rifle, and not even when shooting at moving game with the rifle. What we

see in aiming at overhead coming game is what was shown in Fig. 2, Chapter V. What Mr. Watts could see, with the left



MR. WATTS.

eye closed, is certainly not the pheasant through the gun, as it were. Yet, in talking to Mr. Watts, we do not find our-

selves at cross purposes. We understand each other. Every point that he desires to make we comprehend; and he, too, understands our varied experience—so very different from his own.

His view is that most faults in shooting come from peculiarities of the eyes; that it is often worse than useless to try and alter either physical or optical peculiarities; but that in many instances the weapons can be so altered as to lend themselves to the particular cases. But cures can sometimes be effected without any alteration of stocks, for it often happens that the shooter is perfectly sure that he is doing one thing when, as a matter of fact, it would be physically impossible for him to do it. Take an instance of a man who badly misses a left-hand shot. Without wishing to be personal, Mr. Watts discovered that the bridge of his nose was too high; that, as a matter of fact, his right eye could not see over his nose for the left-hand shots; and that, therefore, on that side the left eye was doing the aiming. The cure was simple when the cause was known. It was an alternative of a surgical operation, or turning round more to the left; the patient chose the latter (the correct method) and succeeded.

Mr. Watts says in favour of clay birds, that when a man comes to him, a flight of pigeons, or a big pack of grouse even, would be comparatively useless for finding out faults. He wants constant flights, one after another, exactly the same, until he has detected that a personal error is constant in the shooter. That cannot be done with chance birds. Suppose there are, for instance, a dozen different flights from his high tower, it may be that the shooter misses one or more of these regularly. That indicates a peculiarity—one that must be followed up until its cause is discovered. Sometimes this will be found easily; sometimes the whole series of trials will have to be gone through in order to discover it. What are they? Well, the first and the most important of all is the shooting quickly right and left at the still target. A very easy test, some will exclaim; a most difficult one, we say. Why difficult? Well, in the first place there is not one man in a dozen capable of plating a shot

gun. It is difficult because it is not the habit of a shooter to do it. The straightaway bird in the field is represented by the stationary target; the way to shoot him is to throw up the gun and pull as the gun touches the shoulder. If you do that at the whitewashed target you are testing your own shooting, but you are not testing the gun.

That being so, you must make up your mind which of the two you want to test when you face Mr. Watts's targets. He has a big range of these some 40 yards by 4 high. Assuming that the gun plates all right as a gun [they do not all do so, far from it], the next business is to throw up quickly and fire your right and left, selecting your second mark yards away from the first. Now on these whitewashed targets, with parallel lines of bullseyes, you cannot select your "brace of birds" as you throw up the gun for the first. At least we found that we could not, and that there was some confusion as to which was going to be our second mark. This resulted, until we found out wherein the fault lay, in the second mark not being exactly in the centre of the shot. Partridges and grouse do not fly in parallel lines, neither do they rise before the gun a hundred at a time all within shot. If they did, the old-fashioned idea of always selecting your brace before you fired at one would be more hard to carry out than it really is. The old idea was right, and the why and the wherefore were demonstrated to us at these targets in no more than three rights and lefts. Momentary uncertainty of which was our second bird took our charge clean between the two doubtfuls. There was something learnt. We had made up our mind which to shoot at, but not in time. Upon the third try, having abandoned the attempt to fix a second before the first shot, we were as right as possible. Mr. Watts does not go for the appearing and disappearing bird; we fancy we know why now. A shooter does not go to school to enter into competition; he goes in order to satisfy himself. Consequently, he will not cheat himself. He will shoot as quickly as he can shoot straight; and quick shooting is no use without straight shooting. If we were going to shoot a pigeon match, we have seen no arrangement we should select

for our test equal to long targets with bullseyes twenty yards apart to fire at. That would be our first practice, always selecting for the second barrel after firing the first. Just opposite this is, of course, to the practice in game shooting, and the reason for it is, because the second barrel is only wanted for the still unknown position of the single pigeon, after firing the first barrel and missing or wounding. We think that the majority of shooters will find that they can improve their form in shooting at these targets, provided they determine to fire as quickly as they can get on to the marks. By the way, these targets have had something to do with the 1897 International Pigeon Shooting, as the Australian, Donald Mackintosh, has been training here under the guidance of Mr. Watts. Mr. Greener, who scored heavily by the help of Mr. Donald Mackintosh, might not altogether have approved of the means used to accomplish the end in view. The question was how to make the gun spread enough, and this having been accomplished by the manner of loading the cartridges, the next step was to accommodate the difference between an Australian pigeon and a blue rock—one that took a good deal of getting over; that it was got over the shooters' 33 yards handicap proves.

The next step from the target is probably that of shooting at clay birds, with the traps three or four yards to the right or left of the shooter. The object of this is twofold. First, to test quickness of shooting at a crossing object; second, to try whether there is a difference of method in the shooter between objects going different ways. After this the overhead birds will be given, first singly and at various angles, and at thirty or forty yards from the point of departure, afterwards nearer and in braces, and if you can stand that then close up under the tower and in strings of birds. Mr. Watts, you see, means to find out your weakness, for his idea is that nobody shoots so well but what they might shoot better.

On the weaknesses of crack shots he has much to say, and he is inclined to believe that driving game is open to the charge of a sport in which you may pick your shots. Indeed

He tells of one crack shot, as much at home at the pigeon clubs as he is in the partridge drive, who relies for allowance at his partridges, just as he did for his rising pigeons at Hurlingham, on the set of his gun, which shoots high. He cares nothing for the side shots or those behind him, there are always plenty in front to choose from. Here is one of those cases which the expert thinks he can improve upon. He says of another great shooter that he can bring them down fast enough upon occasion: but that his is snap shooting, always at an imaginary point in advance of the game, and when that point does not happen to be the right one he can miss just as easily as, at other times, he can kill. To our own knowledge that exactly fits in with the shooting reputation in question. Upon one occasion two shots of this kind were doing wonderful work until their host put them where the birds would come really high. They could neither of them reach them, and the host's remarks proved true, made when he placed another gun in the second line, "They can neither of them hit them at the height," and they could not. They were well within shot all the same, and the fault was not in the guns, but in the off-hand snap shooting.

There is no doubt that for discovering a constant fault there is nothing like a good expert (for there are great differences) standing behind the gun while he shoots at clay birds. We will not say that practice at them is certain to cure the fault; so much depends upon what it is—in what direction it lies; but the true diagnosis is always half the cure.

Now we want to enter a protest. We have always been of opinion that the everlasting non-expert advice was all wrong. It may be summed up in two words—"low" and "behind." Generally it may be right, but we have ourselves heard a well-intentioned keeper giving such advice when, as a matter of fact, the shot referred to was neither "low" nor "behind," and this has not been an exceptional case by any means. The first time we ever shot at "rocketing clays" Mr. Watts stood behind us, and his verdict was "in front" every time it was not dead on. Mr. Izzard, who is well known as a clay-bird shooter, once asked a shot to mark off

upon the target how far he was shooting in front of clay birds when thrown over him. His marks, when measured, were seventeen yards apart. This, he explained, he had got into because, whenever he missed, someone always told him that he was shooting behind. Of course no clay bird is ever thrown at a speed sufficient to warrant any such allowance—not a quarter of it usually—unless there is delay between aiming and pull of trigger. “Behind” and “below” have become a sort of parrot cry in our ears.

The delay referred to above is very common; it is a question of timing. He who pulls trigger the instant he has his aim in the right place will always be late in shooting, and behind, unless he makes some preposterous allowance, such as Mr. Izzard’s acquaintance accomplished to so little purpose. The trigger must be pulled before the gun gets into position, or into correct alignment; so that recoil and stoppage of the movement of the gun shall synchronise. It may be said that this would not matter, provided the gun were constantly leading the bird at an unvarying distance in front. That is true, but although you can lead it as you want for an instant of time, if you try to prolong the process you will find it pretty hard to accomplish. Even if it can be done, the argument that it does not matter does not hold. For this reason: no one can hold a gun still, and the finest rifle-shooting, except from the back position or the rest, is done on a moving rifle.

In quick shooting, even if a gun has but to point at a bird going straight away (equivalent to a sitting mark) the trigger should be pulled practically as the gun touches the shoulder, and this can only be done by the will instructing the finger to pull *before* the stock touches the shoulder. If this is not done there will be rebound, more or less, *from* the shoulder between the pull of the trigger and the shot leaving the barrel; that is to say, the heel plate will bump the shoulder and rebound more or less, and that reaction, however slight, will alter the correct alignment. This complete working together of the gun and the hand cannot always be accomplished even by the best of shots, we believe: but usually it can. There are days when the muscles or the

nerves hang. These are the occasions on which the use of a properly fitting gun comes in. A properly fitting gun will not help the nerves and the muscles to be quicker for any particular shot; but the shooter, finding himself off colour, will be able to lead his bird or dwell on it that instant of time longer than he otherwise, with a bad-fitting gun, would be, and so kill (although in worse time), so that he will gradually recover confidence, and thereby bring his nerve and muscle back to tone. This is when the shooter seems to want to use his sight and be conscious of aligning, just as much as if he were shooting at the running deer at Bisley, or even a standing deer two hundred yards away. Mr. Watts is doubtful whether we ever know exactly where we shoot when we miss. Perhaps not, but, if our guns are exactly right for us, a two-eyed shooter whose right eye is the governor in alignment should know, and does know, exactly how he has aligned. The reason, therefore, he cannot tell where his shot went to is because there are so many causes that may make the shot go where the eye did not align. Jerk, or pulling off, is a fruitful source of error, often caused by a too hard or a too light pull-off. Delay in pulling is even more fertile of error. A twist over of the gun, as in Fig. 4, Chapter III., is a worse, and none of these can be readily detected by the shooter himself. He wants help to discover them.

To return from this digression to Mr. Watts, he does not believe that a pigeon shooter is necessarily a good game shot, nor that a clay bird shot is necessarily so either. He tells us of one wonderful performer at clay birds sent over him, at close range, who failed miserably at game. He points out that the clays come at unvarying speeds—often at unvarying angles. He thinks of them much as Mr. Remington Wilson thinks of driven grouse, that every bird is easy if you only take him at the right time. But you have got to learn the right time, and then to make your muscles obedient to your will.

There is another phase of shooting in which the clay saucers thrown overhead assist the shooter and give him real good practice. It is in using a pair of guns, and in

sustained firing even with one gun. If an unaccustomed shooter fires 30 or 40, 50 or 60 shots overhead in quick succession, he will discover that he is much slower towards the end than at beginning, and that his muscles positively ache. It is only use that will cure this. Then, again, when strings of birds are coming over, it is the handling of the second guns that shows the difference between shooters, and Mr. Watts is of opinion that this is caused by inability of some to keep up the shooting energy through four, or more, quick succeeding shots. He finds, as a matter of fact, that many a man can handle a right and left that cannot go on to three and four: that much fewer can handle one, two, three, who cannot go on to four, even if four is easier than three. They break down from one of many causes; generally they are hurried; often they take impossible shots for number two or three, and cannot recover their balance in time for the next. Again, their energy is not sustained enough to go on to four, although all the four shots may be of similar character in front of the gun. Here the clays are a legitimate form of practice, and we may remark that Mr. Remington Wilson, who is acknowledged to handle his second gun wonderfully, and some other good shots are very fond of this kind of practice.

There is one peculiarity about Mr. Watts's teaching that we should mention. He does not advocate cast-off. He says that, although it may assist the gunner in his shot to the right, it forces the stock from his shoulder to his arm when he is shooting to the left. Mr. Watts, we think, is singular in the strength of his opinion on this point, and for this reason we have asked him to write out in his own words what his views are on this point. We adopt the attitude of listeners here.

Mr. Watts's views about the bend of a gun are in accordance with our own. He aims at placing the rib and the foresight in alignment with the aligning eye with the least possible exertion. In order to effect this more or less bend is always necessary. Contrary, however, to the general opinion, he finds that it is not always the tall nor the long-necked men who require the greatest bend of stock. Long

necks enable the shooters to get their eyes nearer to the handles of the gun than short ones do, but long necks require deep butt ends.

If we look to any modern books we find that straight stocks, certainly as far as the comb is concerned, are recommended as the right lines on which to build guns, and we think that these recommendations are responsible for much bad shooting. Ease of alignment is the one thing required, and no preconceived notions of good form or beauty of outline should stand in the shooter's way in his search after it.

Mr. Watts is the one expert who does not care to use a try gun in the sense of an adjustable stock. He prefers to keep guns of all bends and to place that one in a shooter's hands that he conceives, after trial, to be required. His objection to the adjustable try guns is that they do not feel the same as a solid handle—that a shooter is conscious of the difference, and does not shoot as he otherwise would. Our experience hardly bears this latter statement out. We have shot with a try gun quite forgetful of the fact that we did not hold our own weapon. But then we are only one amongst many, and a shooting school is for many. Besides this, there are such enormous differences in try guns that we cannot wonder if experts sometimes return to the old methods after abandoning the new ones.

Certain it is that Mr. Watts has been eminently successful in fitting greatly differing men, as well as in improving the shooting of a variety of opposites in physique as well as in eyesight.

The most important qualification of a shooting instructor is, after all, the ability to see the shot. Mr. Lancaster has lately reminded us that he told us that this was possible some ten or more years ago. We had forgotten the circumstance, and probably misunderstood him to mean that he could see where the shot struck the earth, or foliage, or the target, as the case might have been; so understood, we should not, naturally, have paid much attention; but that is not what he meant. Mr. Watts not only told us that he could see the shot from our gun, but showed us how we could see the shot from his. This was several years ago,

and as we have been able to see the shot when we have looked for it since—not from our own gun but from another's—we are sure that Mr. Watts has that necessary qualification to an expert in a shooting school.

Mr. Watts has a nice, quiet manner of putting his views forward, and he consequently gets plenty of invitations to shoot, besides having a shooting of his own not very far away from London town.

CHAPTER XXXIV.

MR. T. W. WEBLEY.

UNTIL a couple of years ago the subject of this sketch was engaged with his brother Henry in one of the great wholesale gun and revolver manufacturing businesses in Birmingham. The amalgamation of the business carried on by Messrs. Scott with those of Ellis and Webley has altered the face of Birmingham wholesale work. And now the Webley and Scott Revolver and Arms Co., Limited, is a gigantic concern, with Mr. T. W. Webley as managing director. The position held by the firm is very much the outcome of the broad business capacity of the latter. Mr. Webley enjoys the confidence of the War Office, which for years has adopted the Webley revolver in the Army, and this introduction has served him with foreign heads of States and State departments. Whether we are or are not, as Napoleon called us, a nation of shopkeepers, it is absolutely certain that we could not maintain our army and navy unless we had amongst us men whose personality could bring orders for manufactures to these shores. We remember on one occasion one of the greatest of manufacturers pointing to his steam yacht, notorious for its luxury, and declaring himself to be an international bag-man. Mr. T. W. Webley also knows how to enjoy spending money profitably. One of the feats of which he is most proud is the conquest of Pretoria. The hospitable conquest, we mean. It is not everyone who would think it advisable in the interests of business to set a salmon to catch a sprat. The hired commercial traveller would find his principals raging at him if upon occasion he lived and entertained like a prince in the dearest of all towns for half a year, and then was content to come away with an order for a few paltry

hundred pounds in his pocket. The principal may regard this as the thin edge of the wedge, if he likes; the servant would not be allowed to do so. That, however, was the manner of Mr. Webley's first business with Pretoria, and he was satisfied with any method that acquired the confidence of a President arming to the teeth.

It so happened on the particular occasion of Mr. Webley's visit to Pretoria that he had packed up his traps to come away with this very costly passport to further business in his pocket, and was actually preparing to catch his train, when General Joubert walked unexpectedly into his bedroom and declared himself in a difficulty. "Could Mr. Webley help him?" Mr. Webley was hardly the man to say "No," in spite of the fact that he had never manufactured a shell and knew nothing of the cost of them. Joubert, the commandant, was out of shells for a certain campaign which was coming off in a few months. The Transvaal was at the mercy of any junior Jameson who elected to take a holiday ride into it, and Mr. Webley was the man to whom General Joubert appealed in his difficulty. Needless to say, the telegraph was much resorted to for the next twenty-four hours, and in the end Joubert got his shells in quick time and Mr. Webley was raised to the greatest dignity bestowed upon Uitlanders by the President: that is, he became the recipient of Mr. Kruger's portrait signed on the back. Yet the Foreign Office is never tired of administering commercial lectures to English manufacturers on the slackness of their enterprise abroad and the superiority of the methods of the foreigners. Consuls' reports may be conclusive evidence in the eyes of Ministers bound to Free Trade stagnation, but we think that Birmingham exhibited the very highest enterprise and tact when it secured the manufacture of guns and shells for the English-hating South African Republic. That is only one instance out of many we could name in which English commercial tact has overcome the hostile prejudice of States against our Foreign Office policy. It is no wonder that in his beautiful little villa on the outskirts of Birmingham, surrounded by a garden in which the landscape artist has

done his unlevel best, Mr. Webley should treasure that signed portrait of Mr. Kruger as something for an English business man to be proud of. These villa residences are a characteristic of Birmingham much more than they are of London, for in the former town there are no residential terraces such as abound from Kilburn to Battersea, and from Hammersmith to Bloomsbury. This particular villa, in spite of its artificial river, is only three and a half miles from the gun factory in Weaman Street, which is, at the time of writing, being enlarged so as to hold the plant of the three amalgamated firms. A sharp trot after breakfast gets us there in about twenty minutes, and we are at once handed over to the care of Mr. Whiting, whose instructions are as simple as they are comprehensive—to show us everything.

The revolver making is of course the principal thing to see at the works after glancing at the progress of the new factory, under which is an 80 yards range for the regulation of rifles, and which therefore embraces nearly half the length of Weaman Street. We may mention here that so soon as the new building is completed, a portion of it will be set aside for the reception of special barrel boring and drilling machinery of the latest and most approved type, which is now on the premises waiting to be put into position. So soon as this machinery is running this company will be in position to supply the trade generally with double and single sporting gun and rifle tubes of special quality English-made steel, in their opinion superior to any at present on the market. The revolvers, it need hardly be said, are made on the interchangeable principle, and this in manufacture means machine made, in which the guide to the machine is an exact model of the piece of metal required to be cut out of the solid steel. Presuppose two arms to a machine worked by friction some distance apart upon a common platform. Whatever the platform does both arms do as a matter of course. One of these arms is a guide which follows round the curves of a hardened steel model, and the other arm is a cutting edge which fashions the soft metal under operation to the exact form of the model which directs the course of

the cutter or acts as a guide. This is so whether it is the frame of the revolver that is being cut out, or whether it is holes that have to be drilled or squares that must be chiselled. This machinery Mr. Webley went in search of to America some ten years ago, with the intention of spending £10,000 there upon it; but, as a matter of fact, he found afterwards that Birmingham could do better, and there consequently the money was spent. Up to that time the manufacture of revolvers was in an unsatisfactory condition in Birmingham, the application of machinery was very small, and old methods involving much handwork prevailed. Under such conditions interchangeability was impracticable, yet, strange to say, it was in the manufacture of revolvers by Colt, more than thirty years previously, that the machine system and interchange was first applied to firearms. In 1857 the interchangeable manufacture of rifles was commenced at Enfield by the Government, much of the machinery being American. The London Small Arms Co. and the Birmingham Small Arms Co. followed in the same steps. Nevertheless, when Messrs. Webley secured the adoption of their improved revolver for the Government service no complete plant for its economical manufacture in large numbers existed in Birmingham, and it speaks volumes for the enterprise of Messrs. Webley's firm that they at once determined to build and equip with the most improved machinery a factory specially devoted to this branch of their business. They, and their successors, the Webley and Scott Company, hold consequently the practical monopoly of the manufacture of revolvers in Great Britain, supplying all Government requirements for the Army and Navy, as well as the demand of the colonial and private trade, and they are able to compete on favourable terms with all competitors for orders from foreign Governments. The past financial year has not been one of great earning for the company. We saw the reason when we went through the revolver works: most of the machinery was idle, for there were no Government orders to be fulfilled. The intermittent character of Government orders for war stores is a great trial to manufacturers who have invested

ge sums in plant specially for doing Government work. Three years ago the Government pressed Messrs. Webley to increase their output, and yet last year reduced their orders to such an extent that the factory could not run at a profit. It would seem to us, under such circumstances, not impossible to spread the orders over several years by averaging the probable requirements of the Service. There is another reason also for the shortness of earnings,



MR. T. W. WEBLEY.

several new inventions have been taken up during the last year, of which some automatic pistols and the Fosbery automatic revolver are several, and the expenses entailed in bringing most of these up to their present standard have been paid for out of earnings. We imagine that it will be a costly business to make new models for the new designs, and in wholesale machine-made weapons it must be remembered that it is not only necessary to make a complete and

perfect working model, but, after this is done, models in hardened steel have to be made of each composing piece of metal, and the machines then set to work to the new requirements, on these new models. These are certain to be entirely different from any previous model in all essential parts. Thus in the Automatic Fosbery revolver neither the cylinder nor the frame is similar to the Webley Service revolver, although the barrel is.

This weapon is of the usual Webley Army pattern, except that it is so made that it utilises recoil in order to cock the hammer. The principle upon which this is done is very simple. To put it shortly, the whole revolver, with the exception of the handle, is pushed with a sliding motion backwards until the hammer is cocked, when it is spring-propelled forward again into the usual position. During the sliding motion back and forward the cylinder is revolved one department, so that, as a matter of fact, the difference in speed of shooting between the Mauser and the new revolver is reduced very greatly—that is to say, they are equal in this respect up to six shots. The ordinary jump of the revolver when heavily loaded will be greatly reduced by this means, and the shooting will be as pleasant for the man behind the handle as with the automatic pistols. We believe that advantage will be taken of this absence of jump to use a larger charge of cordite than is used in the Service revolver. This weapon is now so far perfect that it only remains to adjust the load to the springs, or the springs to the load, for any charge that may ultimately be decided upon.

The weapon has a peg or stud attachment to the immovable part. This fits into a slot in the cylinder. The slot is made to slant two ways, so that as the explosion drives back the cylinder a revolution half-way between two chambers is made. The revolving action is continued as the spring drives forward the cylinder by the action of the same projection in the same slot, the latter slanting a different way for this part of the movement.

In a wholesale house we rather expected to find sporting shot guns being made on the same lines as

revolvers, as one, at least, of the London makers has adopted the interchangeable methods of manufacture. This, however, was conspicuous by its absence; the idle revolver machinery that might have been cutting out hammerless ejector actions was not so used, and we were told that the trade is too conservative to admit of uniformity, and that sportsmen are too particular to believe that the same shape and weight of ironwork can fit various shapes and requirements of woodwork. How this may be remains to be proved. On this subject Mr. Webley says: "The shotgun action and the parts of the ejector and other mechanism are machined by suitable 'milling' machines. The complete interchangeable manufacture of shotguns is only applicable to a class of guns for which a larger demand exists, but these must be absolutely the same one as another, and variations of pattern to suit different buyers' wishes could not be carried out. Machine-made guns are largely made in the United States, and by one firm in Birmingham; also by one in Liège. These have been on the English market for many years, but the sale is very limited, and yet the price of fine guns has risen rather than fallen." We can safely say that if ever sportsmen take to the machine-made article, the high prices that prevail will come down with a rush. In the London factory we refer to, girls are employed to cut out, by machinery, work that would have cost one hundred times more to do by hand. When the operation has been performed for every part a few shillings serves to collect the whole and the gun is made. The "sucking fit" that a good workman aims at giving is not to be had under such conditions, and oil, which serves to fill all crevices and so to keep out wet from the works, can no longer fill them when they are irregular and wide in places.

All gunmakers, and we think very many sportsmen as well, know a Webley or a Scott gun (and they are very different) whatever gunmaker's name either bears; and it must be remembered that wholesale makers exist for the express purpose of preventing retail gunmakers from making guns. Scott guns have had a great reputation in America, but we are informed that America now

manufactures most of its own work. There is, however, unquestionably a great American demand still for English names that are highly appreciated over there; and in our knowledge American sportsmen seldom visit Europe without retaining a blank in their cheque books for an English gunmaker. On the Continent also Scott guns are sold as such; and in Italy they have a high reputation. In England a Scott or a Webley gun hardly exists, and we say this in spite of the fact that the work of both can be bought freely in London. Whether it is always sold as Birmingham manufacture is not for us to declare; but, obviously, after it leaves Birmingham that ceases to be the affair of the manufacturers.

It is well known that the makers of .303 double rifles, as well as those who turn out .256 doubles, have been greatly troubled by the bursting or bulging of barrels in proof. This led to several inventions for the holding together of the breech ends of the barrels without brazing. Krupp's steel is changed in its nature when it is brazed, and Mr. Webley's experiments have, he tells us, shown a loss of strength by as much as 10 tons per square inch. In order to get over the difficulty with .256 doubles, he found it necessary to make the lump that is brazed into the barrels of a shape that would hold them without brazing. This he did by converting the outside of the barrels into small threaded screws, and inserting them for three inches into the threaded holes in a lump fashioned to receive them. This revives the principle of the muzzle loader, which had the breeches screwed into the barrels, the reverse of the above, which is screwing the barrels into the lump. Mr. Webley, however, is not of opinion that there is any advantage in using Krupp's steel, and he has a special steel made for him, which he terms the Webley and Scott. This he declares is equally good steel with the Krupp, and will besides stand brazing. Nevertheless, in working it up for .303 double rifles, a saddle back dove tail lump is used, but brazing is also applied.

Some of this steel we saw tested in the very clever instrument by which the resistance of steel to pressure is

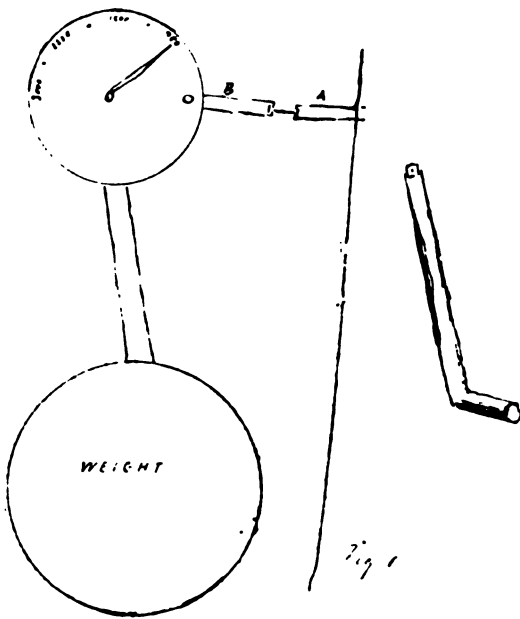
measured here. A piece of the steel of a barrel is cut off and turned down to the shape and thickness of a substantial wire ; it is left thicker at the ends, and an exact length only in the centre is brought to the required thickness for test. No hammering or heating is used. The two ends are then screwed into holders, and these again are fixed in either pulling bar of the machine ; the weight is then gradually put on, and the indicator shows the weight applied just as it does in a spring balance.

It has been remarked by engineers that gunmakers are, as a rule, ignorant of the mechanical qualities of the steel they use except by workshop tests of a very primitive kind. This reproach is not without a measure of truth, and as a consequence the introduction of small calibre rifles, such as .303 and smaller sizes with very high chamber pressures, was followed by difficulties which have cost the gun trade in London and Birmingham serious loss through barrels spoiled in proof and in too many cases either burst or bulged in use. This defect was due to the use of mild steels, which, however serviceable in shot guns, where the pressure, even with proof charges, does not exceed one-half of the elastic limit or one-third the breaking limit of such steel, are quite unsuitable to proof pressures of over 25 tons per square inch, or even to the oft-repeated shock of ordinary charges developing chamber pressures of four times the intensity, per square inch, of those in shot guns. The system adopted by Messrs. Webley and Scott is an application to small arms of the method followed by the makers of large guns and by engineers generally in cases where it is necessary to ascertain accurately the limit of elasticity and strength of the material used in all structures subject to stress. Briefly it is this—a piece [or several pieces] of the metal to be used is cut from the forging, or the crude tube, and “turned,” that is filed, to a standard size, say six inches long, and of a diameter of, say, one-sixth of an inch. The ends are left thicker, and for the purpose of testing are firmly gripped by the machine, which is then set in motion, and the specimen is thereby pulled slowly so as to stretch it. The machine registers the amount of force applied, which gradually increases, as well

as the elongation of the piece. The specimen stretches a little, but, if the pull be stopped, recovers almost its original length. At a certain limit, which varies in different steels, the piece gives much more rapidly, and it is then found that on relaxing the pressure it has been permanently lengthened and does not retract. The stress applied *immediately before* this happens is noted as the "elastic limit," and the process is continued until at a higher pressure the piece snaps in two, and this pressure is noted as the breaking stress. With mild steel in its annealed state the breaking stress is often double the elastic limit stress. Hardened or tempered specimens have a much higher elastic limit, and they are stiffer, but the breaking stress is not necessarily proportionately greater. The metal does not elongate in the same way, and when dead hard snaps at a length very little in excess of that it had at the elastic limit, in fact, with a highly elastic body like hard steel, glass, &c., the fracture occurs almost immediately after passing the elastic limit. The testing machines used in large engineering and steel works are very costly and powerful, capable of applying a stress of fifty tons or more, and are unsuited to the requirements of the gunmaker. The credit for adapting this system of testing to the needs of a maker of sporting arms is due to Mr. John Rigby, the well-known gun expert. It occurred to him to ascertain by careful experiment whether tests accurately applied to miniature specimens would give results comparable with those obtained by the larger specimens in use by engineers. After more than a year's experience of testing various steels by means of specimens having only one-tenth the acting length and sectional area of the pieces used at Enfield and Woolwich, he arrived at the conclusion that with due care and fine micrometers the results so obtained were practically as consistent and useful as the larger tests. This is a very important matter for steel-workers of all trades. A 50-ton testing machine, costing £500 or more, is replaced by a hand-operated one costing one-sixth of the money and occupying little space. Specimens of sufficient size, viz., from $1\frac{1}{8}$ to $1\frac{1}{4}$ inch long, by $\frac{3}{16}$ thick, can be cut from the breech end of a barrel forging

before drilling, and the stiffness and strength of the material ascertained with certainty before the cost of manufacture is incurred.

Stretching may go on and increase in length by 20 per cent. before a break occurs at about double the weight that first produced any permanent elongation. The sketch (Fig. 1) indicates the principle. The turn of the handle pulls the bar A, which acts on the wire and on the bar B. This raises the weight out of the vertical, and this in its



turn acts on the hand of the dial to indicate the pressure exerted.

The diameter of the steel rods we saw tested is .146 of an inch. This has a section area of .0168 of an inch, being about $\frac{1}{60}$ of a square inch, and the record of the two first tests made with the Webley-Scott steel was as follows : 1,150 lbs. and 1,200 lbs. on the area specified. We have therefore an average stress of 31.5 tons per square inch before the permanent elongation of the steel begins. It is necessary, always, to work within this margin, for although

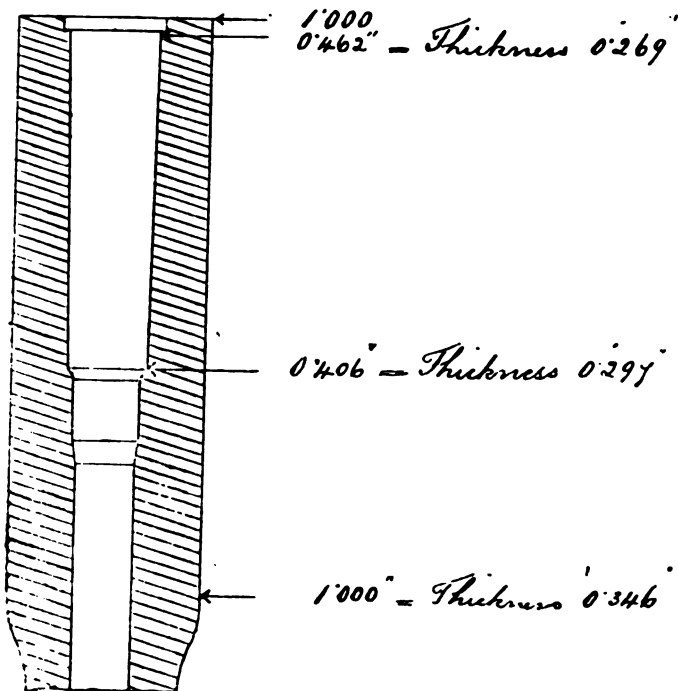
the steel does not break until double the stress has been put on, we know that if more than 31·5 tons is put on a permanent enlargement will occur. What breech chamber thickness, then, is necessary for the ·303 rifle that with cordite powder receives about fifteen tons per square inch pressure at each discharge? We give a section of the ·303 breech end, as made by Messrs. Webley and Scott. The average diameter of the chamber up to the shoulder is ·434 of an inch, and the circumference multiplied by the length, 1·875 inches, gives an internal surface of 2·55 square inches. Some powders have occasionally been known to give pressures of twenty-nine tons per square inch, and there is one that is often used for these small bores that averages about twenty tons. It is necessary, however, to build for special powders, and the proof charge is therefore fixed so as to give a pressure of about twenty-four tons per square inch. This pressure represents a total chamber pressure of 61·27 tons, whereas fifteen tons per square inch represents only 38·29 tons total chamber pressure. We may consider the possible split as a ring round the chamber, or as the length of the chamber. As the latter represents the smallest resisting sectional area, it is best and safest to take it in a calculation for safety.

Messrs. Webley and Scott have succeeded to their own satisfaction in converting the direct stress on the steel rods into an equivalent of resistance to gas pressure within the chamber. We have not been informed how they have accomplished this: but however they have attained a true comparison, which is by no means a question of pure mathematics, they have had to verify their calculations by absolute proof charges within the chambers. It is, obviously, enough for them to know that when they get a steel below a certain tension on the machine it will not stand proof charges. They have ascertained this to their own satisfaction and it is now only a question of seeing that every new batch of steel stands the stress, in the machine, below which they know it is unsafe to go.

The formula used for comparison in the Ordnance text books [based on the diameter of the bore multiplied by

pressure per square inch on the one hand, and the diameter of the walls of the barrel multiplied by two, and multiplied by the tension of the steel, on the other] is obviously not to be relied upon; because the greatest stress is on the internal surface and the lesser stress on the external surface of the barrel. The way big guns are made is so different from the manufacture of small bores, that what applies to one can

0.303" Double Rifle



hardly be said to have much bearing on the other. The inner steel tubes of the big gun are attempted to be made equal to the greater strain put upon them by strengthening them at the expense of the strength of their outer wire covering, or binding. Thus the wire covering is put on in such a manner as to contract the inner tube, so that gas pressure may have to overcome this externally applied

contraction before it can begin to expand the inner tube towards its own elastic limit. It obviously weakens the coils of steel, towards their elastic limit of stretch, to be permanently strained in contracting the inner steel tube, but this is just what the outer circumference can stand, because the stress is not felt by the outer circumference as it is by the inner lining. The difference is as the circumference of one is to the other. So that in the .303 chamber the inner surface bears a strain 2.3 times as much as the outer surface, and there is no equivalent to the big gun system of making the exterior assist more than normally the resistance of the interior.

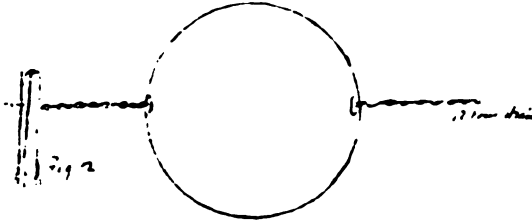
We think that the method of screwing the barrels into the lump, in which great force is used, comes nearer to scientific methods than any other.

By the Ordnance system applied to the measurement of thin steel tubes the tension of the .303 chamber walls would be $.283 \times 2 \times 31.5 = 17.8$, whereas pressure would be for proof charge $.434 \times 24 = 10.4$, and pressure of service charge would be $.434 \times 15 = 6.5$, so that safety would be represented by about 70 per cent. above the bulging point in one case and nearly 200 per cent. in the other. This, however, would not be reliable for them or for any other small bores with long chambers and thick walls.

The following calculation differs from the usually accepted one in taking the pressure to apply to half the circumference instead of to the diameter. It is, we think, much more true where absolute pressures are required to be known, especially when applied to material on which lateral strain assists the movement of molecules on which longitudinal bulge or break depends.

The average thickness of the walls of the chamber is .283 of an inch, and the length is 1.875 inches, so that the least sectional area of the walls of the chamber that has to be split is .53 of a square inch. At 31.5 tons per square inch this is only capable of a resistance of 16.7 tons. But to read it by the light of the machine described above, we must halve the chamber pressure, for the following reason: suppose the ring in figure 2 represents the interior of the

barrel, and a chain be attached at opposite points; one of these chains is fixed to a post, and the other pulls with a



twelve tons strain. It is obvious that this twelve tons strain represents the equivalent to a twenty-four tons gas

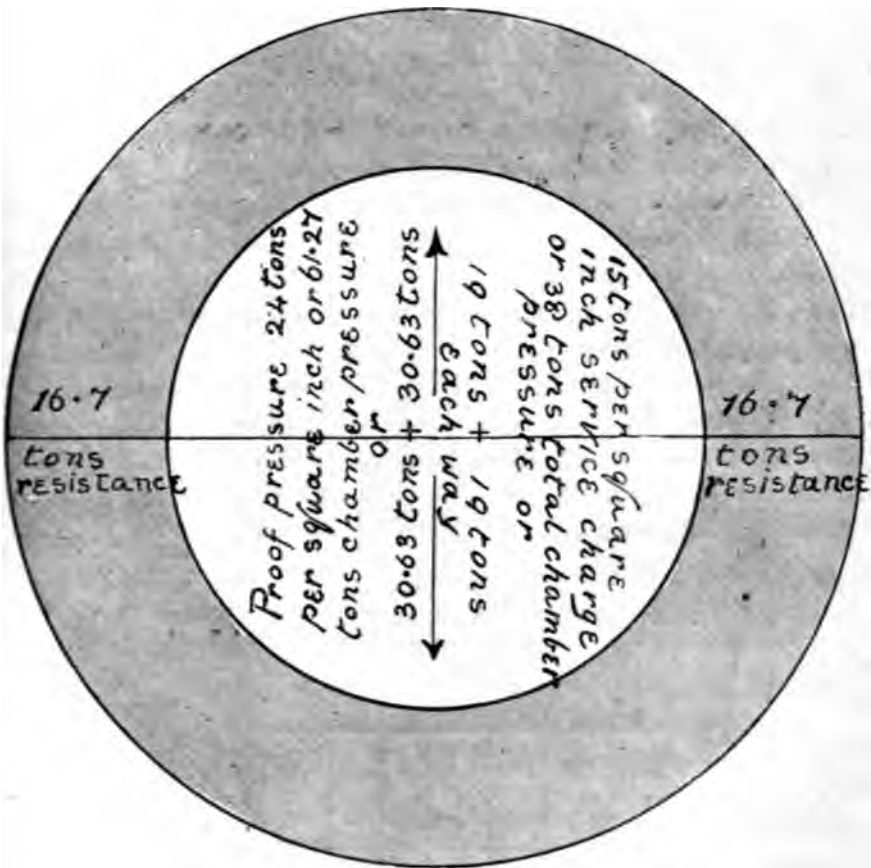


FIG. 3. THE 303 CHAMBER SECTION ENLARGED.

pressure (or more, but it is not necessary to complicate). The reason of this is that the fixed post is pulling the exact

pressure that is applied at the opposite chain. Pass the chain through the post, instead of fixing it, and apply twelve tons, and the effect is just the same; that is, the barrel remains in equilibrium between two pressures of twelve tons, one on each side. This, therefore, is equivalent to a twenty-four tons gas pressure inside the chamber, but as we have 2.55 square inches exposed surface, and a fifteen tons per square inch pressure to resist, therefore we have as much as thirty-eight tons pressure inside the chamber, nineteen tons on each opposite half of the chamber, whereas the thickness of the wall is equal to bear a strain of 16.71 tons each way, or a gas pressure of double, that is of 33.4 tons pressure within the whole of the chamber.

As it is necessary to halve total chamber pressure to get the actual pressure on each half of the chamber, so it is also necessary to double resistance of the single section of the wall of the barrel. Thus, if the pressure be considered as in the direction of the arrows in Fig. 3, then the resistance is A plus B, or double 16.7 tons; that is, 33.4 tons resisting strength to meet 19 tons pressure from the ordinary service charge, or 30.63 tons from the proof charge. It is possible then that the proof charge may get past what is called the elastic stress of the metal and so stretch the steel slightly. But between this and a burst is a very long distance; for, as will be seen in the accompanying table, a burst does not occur until about double the pressure that serves first to permanently elongate the steel has been applied.

RESULTS OF TWO PIECES OF WEBLEY AND SCOTT STEEL CUT FROM
RIFLE BARRELS AND TESTED ON THE MACHINE.

Date.	No. of Test.	Description of Steel.	Original Size.		Elastic Stress.			Ultimate Stress.			Fracture after Ultimate Stress.		Ratio of Elastic and Ultimate.	Elongation.	
			Diam.	Area.	Total.	sq. ins.		Total.	sq. ins.		Diameter at Fracture.	Contraction at Fracture.			
						lbs.	tons		lbs.	tons.		Area.			P. cent.	P. cent.
Feb. 28.	23	Webley & Scott Rifle Steel	0.146"	0.0168"	1150	68452	305	190	113005	594	110	908	473	60	72
"	24	Webley & Scott Rifle Steel	0.146"	0.0168"	1200	71428	318	190	113005	594	110	908	473	60	72

The 12-bore has an average chamber diameter of $\cdot 806$ and a usual chamber length of $2\cdot 5$ inches. Its area is therefore $6\cdot 28$ sq. inches, and a 3-ton pressure gives nineteen tons chamber pressure; or $9\cdot 5$ tons upon each half of the chamber, as against 19 tons each way of the $\cdot 303$ chamber with its 15 tons per square inch pressure. The sectional area of resisting metal of the 12-bore is $2\frac{1}{2}$ inches long, with a less thickness than $\cdot 303$ has. This pressure, according to the Ordnance text-book formula, would require just half the thickness of metal, of the same tension, to resist it. But the Ordnance formula takes no account of chamber length. It is, however, easy to see that calculation based on diameter alone would be misleading for these small bores, for the walls of the chamber vary so greatly at the two ends, and as longitudinal splits do not occur in very small lengths it is fair to assume that the greater thickness of one end of the chamber assists the resisting tension at the other and weaker end. But then we have no shot-gun powders that give double pressures upon occasion, at least not unless the loading is most improper. The reason why the walls of the chamber of the small bores have to be made so much thicker than those of the 12-bores [and the proof charges have shown that they have to] is possibly in consequence of the wave pressures that small bores set up, and which the leaden plugs and machines used for measuring barrel pressures are not quick enough in action to record. That is the usually accepted view. We think, though, that there is another explanation which these wire-testing machines bring out. It will be seen that the steel stretches 20 per cent. before it breaks. The internal circumference of the 12-bore is about twice as great as that of the $\cdot 303$. Similar chamber pressure will produce similar stretching, and it is obvious that the limit of stretch, and breaking point, will be reached sooner where the stretch can only be 20 per cent. of $1\cdot 36$ inches than it will be when it may be 20 per cent. of $2\cdot 5$ inches. The stretch may, in one case, be $\cdot 5$ of an inch before a break occurs; it can only be $\cdot 27$ of an inch in the other, or about one-half of the distance. The same calculation applies to the

elastic limit of stretch, which might therefore be just about twice as much in a 12-bore as it could be in the .303 before a permanent bulge was effected. Therefore we have double the chamber pressure in the .303 and only a permissible elastic stretch of one-half that allowable in the 12-bore before damage occurs. That is, with a 3 tons per square inch pressure for the 12-bores, and a 15 tons per square inch for the .303, there is, in the latter, practically, just double the chamber pressure to accomplish the stretch, and, therefore, the burst or bulge, whereas there is only half the stretch permissible before elastic limit is reached.

CHAPTER XXXV.

WESTLEY RICHARDS.

A RECENT attack upon Birmingham guns, and especially upon reach-me-down guns, applies particularly to Westley Richards, for their guns are entirely of Birmingham manufacture, and No. 178, New Bond Street is an establishment that has been kept open since the year 1812, or thereabouts, for no other than reach-me-down purposes. It is true that these makers will book an order when necessary, just as they have now done for the Crown Prince of Japan, whose 16 and 20 bores are to cost him just £105 each. The fact is that the Royal Jap has sent over designs for the ornamentation to be worked in gold.

The manufactory in Birmingham, over which Mr. Deeley presides, and of which Mr. Leslie Taylor is Managing Director, was until lately hardly the sort of place one would expect to find occupied by a great business like this. It was not easy to find, although one might have been correctly informed as to the street and the number. The entrance was at the further end of a narrow passage in High Street, and when the visitor reached the interior he found it much more useful than ornamental. What may be called the entrance hall was a ground floor, over which was a brick building, resting on iron pillars that passed through the middle of the room, and not reposing on its walls.

The father of the late Mr. Westley Richards started the business early in the century, before Napoleon was beaten at Waterloo, and was at once assisted by the celebrated William Bishop, in Bond Street, of whom we wrote in 1889 :—

“ ‘The Bishop of Bond Street!’ What does that convey to any one of the generation of modern shooters? but to us of an earlier date what memories does it not awaken? Memories of times and of faces ;

of times long since passed away, and of faces, now, alas! 'gone from our gaze.' Personally, we owe to having some of the happiest recollections of our life associated with 'Uncle' Bishop. When, after a preliminary period of raiding on the sparrows with a perilous old horse-pistol and the gardener's rusty gun, we were taken in hand by a relative and 'entered to game,' at the mature age of twelve, it was a gun of 'the Bishop's' with which we made our *début*. From 'the Bishop' also came the beautiful gun bestowed upon us by our good and kind relative and sporting mentor, as a 'tip,' on our achieving the distinguished honour of 'Little Go,' or 'Smalls.' That sporting mentor, himself an acquaintance of Colonel Peter Hawker, 'the Bishop's' great patron and admirer, held the guns of Westley



THE LATE MR. WESTLEY RICHARDS, in his 83rd Year.

Richards in the highest esteem: and in his large battery they chiefly predominated. Since, with the hero-worship of a boy, we held his every opinion as unquestionable, is there any wonder that we should have imbibed something of his predilection for these guns? Although the more extended experience of later years may have caused us to admit another maker or two to share in the position, it has shown us no reason to condemn the bias which had been created in favour of our first love. Poor old 'Uncle' Bishop! How well we can remember the scene in Bond Street as it used to be. The jewellery, which was the other string to the bow of Wm. Bishop, in the window. A large and roomy man, old Bishop, sitting in front of the old white mantel-

piece, always sitting in front of that white mantelpiece, his gouty leg up on a chair before him. Dressed from head to foot in the blackest of black, a huge white frill proceeding from his breast, and an enormous pair of shirt cuffs turned back over his coat sleeves, nearly up to his elbows. On his head the hat, the celebrated tall, broad-brimmed hat, which no mortal eye had ever seen off his head. A truly right reverend and episcopal figure, and worthy of the only Bishop who had ever passed an Act through Parliament, as it was his wont to boast concerning the Dog Act, termed Bishop's Act, a copy of which, on green paper, he was certain to present you with.

"If you were a stranger calling upon him for the first time, the odds were that he would show no more cognisance of your presence-



MR. JOHN DEELEY.

than if you had been in the next parish; and you were left to contemplate at your leisure the imposing *tableau* before you. After sufficient time had been allowed for this to do its work, the foreman would probably take some opportunity of making the great man informed of your propinquity, when you would be suddenly discovered and greeted with condescending affability. As the Bishop possessed decided sporting proclivities, you would not be long in his company before he had informed you that on the morrow he was booked to ride a race, to row a boat, to fight a fight, etc., and when you glanced at his huge corporation and gouty leg you would be inclined to think such tattle favoured strongly of Colney Hatch, or that his old house-

keeper, who each day at noon brought him his accustomed basin of soup, had put in more than the regulation amount of 'strengthening.' The actual truth was, that his part would be vicarious, but that since, as 'Uncle,' he was finding the sinews of war for the performance of the different feats in question, he might be pardoned for thinking that his was the most important one.

"What stories were told about him. About the West End men and their 'Uncle' Bishop. About the large, solemn men in black who used to attend as disguised footmen at the symposia of his clients. About the irruption of unmannerly bailiffs into those symposia, and of the professional 'one, two, three,' on the part of the large men in black, and the flight of the rude disturbers. This, and much more, used in those days to be 'caviare to the Colonel.' There is no doubt about it that Wm. Bishop was a character, but, withal, a man of singular talent and shrewdness. 'A rough-cut gem from Ealing,' as Percival well describes him, in those verses which he wrote on him; and it was a common thing to see his invalid chair surrounded by men of the highest position and fashion, who admired his mother wit and conversational talent. *Apropos* of the hat, it was said that when he was lying in his last illness a bet was made, in our opinion in questionable taste, that if by any means his room could be entered, he, even in bed, would not be found without the hat. The experiment was made, either by collusion with the nurse, or in some way, and he was nearly taken by surprise, but yet had time to get the hat on before his visitors entered the room. In reference to the Dog Act, to which we alluded, the thanks of the many lovers of the dog are due to Wm. Bishop, for the energy and skill with which he conducted this Bill to a successful issue, with the assistance of his influential patron. By this Act dogs are now property, and as such under the protection of the law.

"It is unquestionable that Westley Richards' guns owe much of their success to the personal and skilful management of Westley Richards' famous lieutenant, Wm. Bishop; under his *régime* the house in Bond Street became quite an institution.

"Full of suchlike old recollections, we recently directed our steps to the premises of Westley Richards, in Bond Street, which we had not entered since 1860, when Bishop was the presiding genius. If our memory faithfully reproduced the scene as we then beheld it, the opening of the door sufficed to dissolve it into thin air. All was so utterly strange and new: the very room itself seemed to have changed in shape and arrangement: in fact, so complete a metamorphosis met our view that for a moment we stood irresolute, uncertain if we might not perchance have stepped into the wrong house. The courteous manager came forward to our assistance, but could do nothing to help

us to link the present and the past, and we felt quite 100 years old, so entirely had all that we knew been swept away. The only relic we could find still remaining was the old picture of Bishop, full length (of course, in the hat), and with a gun in his hand, which, perhaps, some will remember as hanging against the partition wall in the back room. This is a capital likeness, and we were pleased to recognise it. After a short while spent in viewing the changes time had brought, we turned with some curiosity to see how the modern representatives of the Westley Richards gun compared with their predecessors to which we had been accustomed.

"The old guns of this make had always much to recommend them. Although essentially Birmingham built, they were totally distinct



MR. LESLIE B. TAYLOR.

from the class of Birmingham guns. Why this should have been the case we are unable to explain. Colonel Peter Hawker himself, when passing his strictures on Birmingham guns as being in general coarse and ill-designed, entered the saving clause that he made exception in the case of the work turned out by Westley Richards. A Westley Richards gun of forty years ago was invariably a thorough sportsman's tool, and had all the appearance of being what it was. There was nothing to distinguish it from the best London gun as made by one or two firms at that day. It was neat and elegant in outline, and balanced and handled to perfection. The parts fitted closely and accurately, and the general *tout ensemble* exhibited correct taste.

" In two respects the old Westley Richards gun stood out distinctly: first, the excellence of the locks: instead of the hammers requiring some force to cock, and acting with a short, strong fall, these were beautifully soft, oily, and pleasant, depending on a long gentle stroke for effective action rather than on a short hard one, beginning easy at the start, and gradually getting stronger and stronger all the way to the end. Second, we never knew an old Westley Richards gun that was not a good shooter and that did not discharge its shot in a smooth and sportsmanlike manner, free from unscientific violence. So impressed have we always been by the existence of this latter quality in these guns that we should always feel confidence in the field if a strange gun of that make were put into our hands, though we should by no means experience that feeling in the case of the majority of guns.

" Westley Richards is an 'order' firm in a very large degree since the invention of the telephone. All the work is done at Birmingham, and the London showrooms are merely for the convenience of intending purchasers. The guns are present in large quantities. Through the kind courtesy of the manager, several of these guns were handed down and handled for our inspection, and here again we may note another peculiarity that marks out the firm of Westley Richards from all others—*i.e.*, that all their guns are hammerless. Not a single gun is ever on any account manufactured by them on the hammer principle unless it is specially ordered. The reason for this is that they make for the present only (by whatever fancy that may be governed), and thus confining themselves to the ruling fancy of the day, they accumulate no stock, and are ready to take advantage of any temporary tide of fashion which rolls in. In short, their time is the present, not the future. For these reasons, not a single gun will be found on their premises except the hammerless, but of these they have a very large stock, and their long experience has enabled them to furnish them so as to suit the individual peculiarities of sportsmen, and here comes in the speciality of Westley Richards, that whereas for a gun by any other first-rate maker it would be necessary to wait several months for the completion of the order, here a sportsman may be suited immediately, and in most cases as well as if he had waited four or five months, and even then, perhaps, might not like the gun when he sees it. We found the present Westley Richards gun to retain many features in common with its predecessors, although, being made on the Anson and Deeley principle, it is not quite so elegant in its outline. They used to be peculiarly 'snake-like,' rakish, and elegant. The gun now is more 'cobby.' This stumpiness of appearance is due to a width and thickness in the neighbourhood of the lock. If this part could be lightened somewhat, and lessened in

circumference, without curtailing necessary lock space, it would add much to the elegance of the gun. Nevertheless, they are still handsome guns, and fully up to the old Westley Richards in perfection of accurate fitting of the parts, in wisdom of plan, and in the neat, quiet, good taste for which they were ever distinguished, which quality is not the property of all guns, for in many much gingerbread flashiness frequently co-exists with want of symmetry and with crevices and defective finish. The Westley Richards guns never had much engraving: neither have they now, thus agreeing with those of the best and oldest London makers. As ivy is the bad mason's best-friend, so on second-rate guns does gaudy engraving conceal mediocre work. Westley Richards used to make the breechloading guns with



MR. A. H. GALE.

a peculiar wood lump or bump on the joint of the fore-end. This used to be made in connection with a wood bar, and although it had its value, and helped the hand, yet we always thought it the only blot on an otherwise handsome gun, and it is, we are glad to say, now dispensed with. The wood bar has also disappeared in favour of iron. Since, for reasons which we have already given when explaining why these guns are all hammerless, the firm work for the prevailing fashion only, they therefore eschew all out-of-the-way work, neither do they go out of their way to indulge any of the various eccentric fads which appear to be rampant at the present day. Hence none of those excessively light guns which some folks affect are to be found on their

premises, nor pop-gun 28-bores, nor barrels of 24 in., etc. Their guns are of the ordinary lengths, weights, etc., which experience has commended to the ordinary sportsman. For the same reason they make far fewer choke-bore guns now than at one time they did. There was a time, they say, when all their guns had to be choked.

"Although it is now common enough to see barrels fastened by a top connection, and projections of the rib are legion in their variety and ugliness, it is to Mr. Westley Richards that we owe the first invention of a top connection fastening. All breechloading guns were formerly made on the Lefauchaux under-lever principle. The generality of the best London makers omit a top connection, but no Birmingham maker does so. The guns of Westley Richards are furnished with Anson and Deeley's lock and cocking arrangement, and with their patent ejector, one feature of which is that the ejecting mechanism of each barrel is complete in itself and independent. It does not in any way alter the breech action or the shape of the gun. If it should be at any time accidentally put out of order, the cartridges can be removed in the ordinary way by hand."

The late Mr. Westley Richards, of Ashwell Hall, Oakham, who retired from business over twenty years ago, and stoutly maintained until his death that he could make farming pay even in those bad times, joined the business of his father in 1855. He was always a hunting man and on occasion kept as many as thirty horses in his stables. He was High Sheriff of his county, and was a member of the Carlton.

Mr. Richards remained a large shareholder of the gun business up to the time of his death. He was born in the year of the Battle of Waterloo, just three years after his father, Mr. William Westley Richards, had set up in business in High Street, Birmingham, and four years after the establishment of the Birmingham Proof House. At an early age he was led to take an active interest in the business, and though it gained a good deal of celebrity under the direction of its founder, it was left to the younger Westley Richards to raise it to the high place it occupies in the world to-day. Mr. Richards' wife died some years ago, and his only child, now the wife of Sir Henry Bromley, survives him.

When we were at Birmingham lately, it struck us that it must have been not only a genius, but a succession of

masterly minds, that taught the shooting men of the West of England the way up the narrow entrance. They would never have found out the narrow passage had not invention been to be found at the other end of it. The firm have had a long series of clever inventions since 1821, when the first patent was taken out. It has had something to do with most of the Government weapons, and some of the ammunition also. Thus, the solid drawn brass case, upon which so much now depends, was the invention of this firm. Mr. Westley Richards also assisted Whitworth in working out his rifle.

Mr. Gale, who is the successor of Uncle Bishop, tells me that this rifle was really the invention of Brunel, who, not being a gunmaker, consulted Westley Richards, and it was in consequence of this that Whitworth got to hear about it, and the result was this six-sided, instead of grooved, rifle, with its one turn in twenty inches. Government, moreover, acknowledged with a £1,000 cheque the assistance Mr. Westley Richards rendered to Captain Minié in working out the pattern of the first Enfield rifle. Then, in 1858, Westley Richards introduced the first breechloading carbine ever used by the Government.

Then again, when the Martini-Henry rifle was adopted there were but two before the Government. The other one was Westley Richards' falling block, and the Martini was an infringement of that patent. The consequence was that the firm shared the Martini royalties. Even the latest Lee-Enfield rifle has not been evolved without the great Birmingham firm having a share in the plunder, for it received £3,000 from the State for perfecting the connection of the bolt-head and the bolt, which in the Lee-Metford rifle had been so badly contrived as to render a large proportion of the rifles unserviceable in a very short time. In fact, it is difficult to invent anything in gunnery nowadays without knocking up against some previous patent of Westley Richards'.

From the point of view of the sportsman, the firm were pioneers with hammerless guns; the Anson and Deeley was the first workable gun that was cocked by the fall of the barrels, and not, as in Mr. Murcott's patent, by pressing the

opening lever. This principle had many followers at once, and now there is no hammerless gun made that does not cock itself, either by the opening or by the closing of the barrels. Then came the ejectors, and again Westley Richards was, if not first in ejecting the empty case, so far first as to do this selection, between the spent and the unspent cartridge, by the means that are now generally approved ; that is to say, the fall of the hammer was made a necessary preliminary to put the ejecting mechanism in work. This connection between the gun-lock and the ejector-lock is done by means of a sliding mainspring, and this system is variously worked out by other gunmakers, some of whom use a sliding rod instead of setting the mainspring to slide forward. The object in all is the same, and is to prevent the ejector acting upon the right or left barrel before its own corresponding hammer has fallen. The Anson and Deeley has been still further improved by the addition of a blocking safety of a totally new design. Nearly all gunmakers have now abandoned the tumbler blocking arrangement, as it is found in practice that anything that will jar-off the trigger sear will jar-off the blocked tumbler also. The new device for safety is unconnected with the ordinary automatic safety-bolt, and is intended to give security against a jar-off of the second barrel when the first barrel is fired. This is by no means a common fault, unless very light pulls are required. Then it becomes a great consideration, and the means Messrs. Westley Richards have adopted is to make the pull of one trigger block the sear of the other until the trigger is released and the shock is therefore over. This is very clever, and now that light pulls are in such great demand it ought to be very useful. Mr. Gale assures us that he is perfectly safe in sending out guns of 1 lb. for the first, and 2 lbs. for the second, barrel by the application of this arrangement.

Like other makers this firm is building double .303 and .256 sporting rifles. They are moreover making a beautiful sliding block single .303. Both the singles and the doubles weigh $8\frac{1}{2}$ lbs. exactly, so that the only advantage of the single rifles is their cheapness. Mr. Gale points with pride

to a photograph of the Prince of Wales and his first tiger, taken on his memorable visit to India. There the Prince is holding a single Westley-Richards rifle of the early falling block pattern.

We think that perhaps the most useful improvement



THE PRINCE OF WALES' FIRST TIGER. Shot with a Westley Richards' single drop down action Rifle.

that has been introduced at this establishment for many years is the detachable sliding block single rifle, with additional smooth-bore barrel. Here is an ordinary military rifle that will pack into a gun case. The weapon costs £20,

and extra barrels for it, either rifled or smooth bore, cost £7 10s. each, so that for an expenditure of £35 you can take out in one small case what is really equal to two rifles and a smooth-bore. This weapon is the invention of Mr. Leslie B. Taylor, who has applied the same principle of detaching barrels to the Lee-Enfield; and endowed it, besides, with an automatic top safety bolt for sporting purposes. This rifle, or any other sliding bolt rifle, can have the Westley Richards rocking peep sight affixed to it; by this invention the difficulty of the conjunction of the sliding bolt and the peep sight has been overcome.

There are two shooting grounds belonging to the Birmingham and London establishments. The latter is close to the Welsh Harp Station, and is fitted with everything that the Middlesex Gun Club desires. Mr. Gale takes a great interest in this club, and he tells us that he is a firm believer in practice at clay birds. We put it to him whether much of this sort of shooting at birds which obviously slow down very rapidly would not tend to make men shoot behind driven game. Obviously the clay looks at first to be coming much faster than it is by the time the trigger is pulled. To be successful, therefore, you must not shoot as much in front as the first sight of your "game" indicates. This is just contrary to what happens with the living game. Mr. Gale believes in our theory, but not in the fault in practice. He has never known a game shot, he says, who did not improve by shooting successfully at the clays, and as our question was prompted by theory alone, and has prevented us from becoming a habitual breaker of saucers, we have nothing more to say.

Of the "reach-me-down" hammerless ejectors, this firm has no less than 10,000 out and in use, and as reach-me-down has a bad ring about it in tailors' establishments, perhaps it will not be amiss to give a few names of well-known shooters who have been purchasers of them. The Prince of Wales and the Dukes of Cambridge, Edinburgh, and Connaught have each a pair; besides, here are others who to our knowledge trust to Westley Richards:—H.R.H. Prince Christian, Marquis of Ormonde, Marquis of

Queensberry, Earl of Egmont (keeps three ejectors going all the year), Viscount Curzon and Lord Hood, Lord Suffield, Lord Darnley, Lloyd Price, Earl of Essex, Duke of Somerset, Maharaja Cooch Behar, His Excellency Count Deym, Sir Francis Burdett, General Sir Frederick Carrington, Lord Euston, Marquis of Exeter, Lord Gerard, Hon. Charles Hardinge, F. S. Jackson (the cricketer), Sir D. Lysons, Lord Lathom, Lord Cowper, Lord Macnaghton, Lord Greyde Wilton, Sir Peniston Milbanke, Sir Andrew Noble and all his family, Sir Raymond Burrell, Admiral Stephenson, Lord Stalbridge.

Mr. Deeley has been the principal business man in the firm for twenty-five years. He has lately retired from the position of Managing Director in favour of Mr. Leslie B. Taylor, who has been for twenty years connected with the business, and who had, prior to this, been responsible for the practical management for five years. The sole management of the great business now rests entirely on him. Mr. Deeley is chairman of the Company, and he tells us the last was the best year the firm has ever experienced, and not even in the days of the Bishop of Bond Street did the London house do nearly such a business as fell to it last year. How it would have surprised Uncle Bishop to go into the telephone room and discuss the design of a gun with the foreman of the works at Birmingham, as Mr. Gale does to-day.

By the way, when we called upon Mr. Gale to give us the history of his firm, he started to read to us from a paper that we thought we had seen before. It was an article that had appeared in *Land and Water* in 1889 that Mr. Gale was quite unconsciously reading, certainly to our amusement, if not to our edification.

Rifles, and especially single rifles, for Africa, including the Transvaal, have always formed no small part of the business of Westley Richards. At Wimbledon their rifles have done well also, but were lately not so generally used as were the Gibbs-Metfords. The choice of a rifle is now a much less simple matter than it was only a very short five years ago. Since then the .256 has been made famous by the destructive work it has done on big game. Mr. St. George

Littledale and Mr. Selous and many another good sportsman have spoken in the highest terms of praise of these small bores. We do not think that it follows, as a matter of course, that less experienced shots will be equally satisfied with these gauges. If the choice of a rifle has been complicated by this small-bore, high-velocity invention, the selection of a projectile has been made even more difficult. There is no doubt that it has become possible to make one small rifle kill every kind of game ; but, it is also much more easy to make it unsuitable for any, by a slight mistake in selection of projectile. It may be taken that the smaller the



WESTLEY RICHARDS' GROUND.

animal fired at the more weakening of the outer covering of the bullet becomes necessary, or the more soft lead nose should project from the envelope of hard metal. Thus, for red deer it is hardly possible to split the cases too much, or to expose too much soft metal, and yet to leave bullets strong enough to withstand the rough usage they get in passage up the barrel. But when we come to consider the amount of weakening or strength on the one hand necessary for lions and tigers - usually requiring a weakened bullet coat—and buffalo and elephants on the other -usually requiring the hardest possible coating- entirely different considerations have to be met at each turn of the animals. That is to say,

the head shot and the heart shot of any of these require different bullets, or, what is equivalent, to a great extent, different distances. The speed and the resistance that will break up a steel-coated bullet must both be enormous. The bullet so hard that it would become misshapen only upon impact with the skull of an elephant, at short range, would probably pass through the animal's body at 100 or even 300 yards without expanding in the smallest degree.

But, again, penetration may entirely depend on the distance of the animal from the rifle. Bearing on this, it is well to remember that the Small Arms Penetration Committee found that in firing the Lee-Metford, '303 Government pattern, at walls of sun-dried bricks the penetration at three yards distance was only five inches, whereas it was fifteen inches at 400 yards, and decreased from this point as the range was extended, a fact which proves 1,400 ft. sec. to be the most penetrative against this substance with nickel-coated bullets, and that with higher velocities the nickel breaks up. At 100 yards it required forty inches of deal to stop the '303 bullet or twenty-one inches of oak, and the projectile from the '256 at the same distance will go through forty-five inches of the former timber or twenty-eight inches of the latter.

The following table is based on calculations, and is mostly calculated from the velocities given as correct in the Hon. T. F. Fremantle's "Notes on the Rifle":—

TABLE SHOWING ENERGY OR SMASHING OR PENETRATIVE POWER, AND ALSO THE AMOUNT OF FALL OF VARIOUS BULLETS IN A FLIGHT OF 100, 200, AND 300 YARDS.

— —	Calibre of Rifle.	Weight of Bullet in Grains.	Muzzle Velocity ft. in secs.	Muzzle Energy in foot pounds.	Fall of Bullet at 100 yds.	Energy at 100 yds. in foot pounds.	Fall of Bullet at 200 yds.	Energy at 200 yds. in foot pounds.	Fall of Bullet at 300 yds.	Energy at 300 yds. in foot pounds.
	In.				In.		Ft. in.		Ft. in.	
Express	400	205	1,900	1,652	6.1	1,030	2 7	659	7 5	457
"	450	330	1,800	—	6.5	—	2 7	—	7 2	—
"	500	444	1,800	3,212	6.4	2,320	2 6	1,675	6 10	1,214
"	577	592	1,700	—	7.15	—	2 10	—	7 7	—
Martini-Henry	450	480	1,300	1,808	11.9	1,417	4 4	1,181	10 10	1,018
Lee-Metford	303	215	2,000	1,954	4.6*	1,625	1 8	1,349	4 2	1,135
Mannlicher	256	156	2,350	1,924	3.5*	1,595	1 3	1,324	3 2	1,097
Westley Richards										
Long Range...	500	570	1,542	3,005	—	2,293	—	1,780	—	1,428

* It is questionable whether mathematical calculation is of any use with these rifles, at these distances. Some rifles, certainly, in consequence of the flip, throw higher at 200 yards than the line of the axis of their bore.

This long-range Westley Richards sporting rifle, which we have included in the table, is new to us ; it has very much the character of the old match rifle, and it will be seen that its projectiles retain much greater energy at 300 yards than do those from the express of similar calibre with their 444 grains bullets. Although the drop of the bullet is obviously much more than that of the express, the energy is higher at every point after 100 yards, and, of course, beyond 300 yards, if such distances in sport are wanted, the retained energy of the heavy bullet is proportionately increased. We do not know that any other maker takes so much trouble to turn out a rifle, and suitable ammunition for it, that will do so many things. We have already commented upon the perfect design of the interchangeable weapon turned out by Westley Richards. As the firm do not care to risk their reputation with the .303 or the .256 before a charging buffalo, they provide an interchangeable .577 barrel as well as a .500 "long-range," and to these they add a .303 or a .256 and a smooth bore. Then by a change of ammunition they do their utmost to make one barrel do the work of another, in an emergency, by making both their hard and soft bullets of the same weight, and having the same trajectory.

In reply to questions that we have put, the following information has reached us :--In the Westley Richards make the .256 is rifled to right and the .303 bore is rifled to left: their .303 bore rifle is made on the Enfield five-groove system, and the depth of the grooves is .004. It has about one turn in ten inches to the left, and with the cartridge and load they recommend for sporting purposes gives a muzzle velocity of about 2,000 feet per second—[37 grains Rifleite or Cordite, 215 grains bullet]. The sporting bullet they supply is of the same weight--a great point in our opinion, and although one is hollow in front and the other is not, there is no trajectory difference in practice, whatever the experts may say. Their .256 bore rifle has four grooves, and the depth of rifling is about .006 with a right twist, and gives a muzzle velocity of about 2,400 feet per second. A proper appreciation of the pressures given by the smokeless powders and the required strength of steel to resist these pressures are essential to the

successful production of double .256 and .303 bore rifles, and are distinctly the attributes of that knowledge, or stored-up experience, which exclusively belongs to high-class makers. By using the very best material, the qualities of which are ascertained by actual experiment, and then by placing the strength of the metal in the required place, a first-class reliable double .303 or .256 bore rifle can be produced of the weight we have already stated.

From eighty to ninety thousand rifles holding high reputation for accurate shooting have been supplied by Westley Richards to South Africa, seventeen thousand having lately been supplied to President Kruger. The system of rifling plays an important part in the wear, and ever since Westley Richards introduced the rifling known as the Whitworth, which was communicated to him by Brunel, the great engineer, the firm has made a special study of this question. Fourteen years before the British Government used the Metford rifling, Westley Richards and Co. were converts to the system, and constructed all their single and double weapons and match rifles on it, and still employ it for all bores of express rifles. Their Metford match rifles gained celebrity in the old Wimbledon days, especially at the meeting of July, 1883. This is how the firm describe their procedure:—"The adjustment of the shooting of double rifles—[sometimes sent out to shoot two distinct diagrams a foot apart, even by crack makers, as the Hon. T. F. Fremantle tells us]—depends upon the construction of the barrels and the efficiency of the methods employed to secure a permanent and correct laying together, so as to throw all shots together like a single barrel, after which the rifle is shot, and the sights graduated at each range, both for elevation and horizontal accuracy." No double rifle demands more careful attention to the foregoing points than the double small bores of .303 and .256 cal., which have to be laid very wide apart at the muzzle. It is only natural, with their high reputation for rifles, that they should have made a special study of these small bores, and should have succeeded in producing a double .303 bore rifle, for Rifleite smokeless powder, safe and of undeniable accuracy. The barrels are constructed with Whitworth fluid

compressed steel or Krupp's. The high and reliable qualities of these, for tenacity, ductility, and durability, render them, in their opinion—and it is one we endorse—superior to all other kinds, and the best possible materials for these rifle barrels, when they are put together without undue heating.

We have already quoted some opinions of Westley Richards' shot gun, written in *Land and Water* in 1889, and it is not necessary to add very much to what we then said. There is no doubt about the finish of the best guns. The way in which the dovetail itself lies into the false breech is a lesson in finish. Those who do not know the action would not put their fingers upon the joint without first opening the barrels, and as this high finish is extended round the whole surface of the dovetail as well as its shank, and as its shape precludes the use of the hammer to bring the two surfaces together, it may be regarded as the outcome of consummate skill, in filing and finishing, applied in the most difficult form. The firm hold to the opinion that their design in handle, false breech, and breech is not approached elsewhere. We cannot go as far as that, but the rounded surface of the woodwork, which the Anson and Deeley action enable them to get, undoubtedly has permitted them to cut away a great deal of the width that was once an objection. We do not wish to be understood to mean that there is an objection to a wide false breech. Quite the contrary. We think that a massive false breech gives the appearance of a sound gun, whether it be absolutely necessary or not. The less heavy the parts behind it the more metal should be put into the false breech. That is our view of the symmetry of a gun, otherwise the necessary width of the breech itself seems to be out of proportion to the lightness behind it.

We are glad to hear from Mr. A. H. Gale that every gun is tested at the plates with a target up, and that the selected circle is never relied upon. Indeed, it would be extraordinary if a firm that had had so much rifle sighting to do should allow their shot guns to choose their own targets. In our view the correct testing of a rifle is child's play to that of testing a shot gun properly. A shot gun is so far from lending itself to scientific accuracy of testing

that, at the best of times, a fair average has to be struck. Smooth-bores shooting ball have a habit of putting them anywhere and everywhere except in the right spot, yet many gunmakers assume that this erratic characteristic disappears the moment an ounce of small shot is put into the same weapon. We have not found it to do so, and we are sure that the shot gun requires quite as much regulation for centring as any brown bess that was ever turned out. This observation applies with the more force as the patterns become closer. It is clear that when a pattern covers a four-foot circle it matters less whether the centre is six inches out than if the killing pattern only covers twenty-five or twenty-six inches at forty yards, as is not now very uncommon.

All the double guns and rifles made by the firm have the powerful Westley Richards top fastening. It was patented by Mr. Westley Richards in 1858, improved in 1862, and the patent was for a top projection "with hook, eye, or suitable fastening." This, they assert, included the cross-bolt system, but that, being convinced that their form of top fastening was better, they have always used it for the following reasons:—The top projection is a grip in itself, and does not depend upon the bolt for its support. Indeed, very little bolting power is needed. In order to establish this they quote the opinion of the late Mr. J. H. Walsh. He said :

"The Westley Richards action is opened by a top lever, which is so convenient that by public accord it has been adopted by most of the fashionable gunmakers of the day—that is to say, wherever it was possible to do so. Even the Purdey snap was brought out with a lever under the guard, and, indeed, so was the Greener cross-bolt. To Westley Richards, therefore, we owe an invention: first, of the top connection, known as his in its entirety: secondly, of the top lever: and thirdly, of the doll's-head used in combination with other bolts: and all of these so early as 1862. The first great improvement in the hinged or Lefauchaux action was made by Westley Richards."

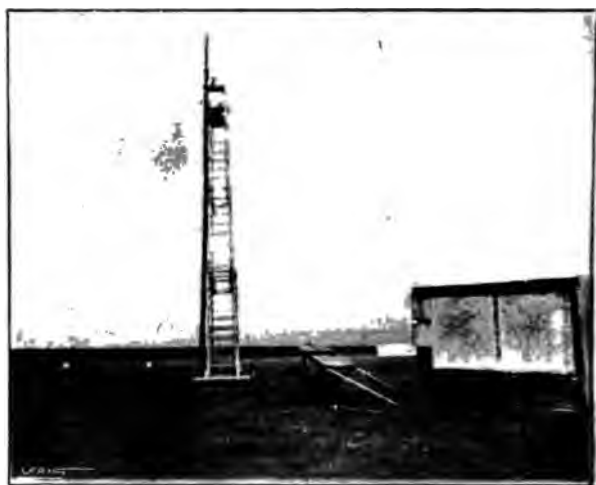
And, writing in 1879, Mr. Walsh added :

"For many years we have never given a single opinion *ex cathedra* on any gun action, exclusively the property of a particular firm,

except as to the top connection of Mr. Westley Richards. This action we condemned in 1867 as in our opinion too small in its bolt bearings to bear wear and tear, but having subsequently enlarged them considerably, he requested us to put it to the test of actual use, and recommend it or not as we might think right. Having stood this test without the slightest symptom of wear, we have, since the year 1869, recommended it to our friends as in our opinion free from the defects inherent in its rivals."

In February, 1892, the firm wrote :—

"We now fired the gun with 84 grains of Schultze powder and 1½ oz. of shot: there were no lumps whatsoever under the barrels and no bolt in the top fastening, but neither the action nor the projection



WESTLEY RICHARDS' GROUND, SHOWING TOWER.

nor the cartridges were in any way damaged. We also fired it without the top bolt or the under lumps or the fore ends attached to the barrel, using the ordinary charge, and with equally satisfactory results. The cross-bolt system being a straight extension, and relying for its grip upon the bolts, cannot be fired without the cross-bolt and the under-lumps in the manner we have described."

Mr. Walsh added to this :—

"Mr. Westley Richards himself was accustomed to demonstrate the slight strain put on the bolt by removing it and substituting for it a few turns of pack-thread, which were quite sufficient to keep the barrels down during a discharge, the separation being still prevented by the doll's-head."

We can endorse the whole of these remarks as far as they are comparative with other top extensions, but to say, as Mr. Walsh did in another place, that no length of time and work would loosen the joints, was an error. Neither iron nor steel has arrived at that degree of perfection in which rust and friction will not wear its surface, and we have seen guns of all makers loosened at the joints after constant wear and heavy use. There seems to be a consensus of opinion amongst gunmakers in favour of the doll's-head extension for heavy double rifles of the high-velocity character. This of itself is enough to establish the character claimed by the firm for these top extensions; at the same time, and by the same witnesses, it is proved to be not a necessity in the ordinary twelve-bore scatter gun. But if it is not a necessity now, the case was very different thirty-five years ago, when half the new guns not so jointed, were unable to stand an ordinary first shot without gaping out the black and dirty fact of the fallibility of iron, between the barrels and the false breech.

The Westley Richards' patent hammerless gun, the Anson and Deeley, was the first gun in which the cocking of the tumbler was done by the opening or closing of the barrels. Nobody before 1875, when it was introduced, had succeeded in making an action with so few parts, and of such great strength. There are fifteen fewer parts in the gun than in the old lock gun with external hammers, and the limbs are, consequently, enabled to be made much broader and stronger. The mainspring requires no swivel or stud, the tumbler possesses great strength and solidity, the bent being nearly twice the breadth of that in the ordinary tumblers. The sear has a wide thick nose, but by means of the extra leverage given by the long shank of the sear, a light pull-off is permissible, notwithstanding a strong sear spring which keeps the sear firmly in the tumbler bent until the leverage is applied. The tumbler or striker, being in a direct vertical line with the base of the cartridge, delivers the blow to the greatest possible advantage. The striker and tumbler being in one, operates directly upon the cartridge without the intervention of a loose striker.

Mr. Deeley tells us that he is of opinion that many of the so-called hammerless guns are simply guns with concealed hammers, *i.e.*, the hammers are inside instead of outside the lock. Guns of this type, he says, have nipples, plungers, and plunger springs. The exceptional strength of the Anson and Deeley hammerless gun is proved by the fact that the inventors do not recommend the use of snap caps, and will allow any of their guns to be snapped off any number of times without cartridges or snap caps in the chambers. This is explained by the great bearing surface of the tumbler. This type of hammerless gun has no doubt been the means of preventing many accidents which were liable to occur with guns having external hammers. It completely revolutionised the breechloader, so that at this day, in England especially, on the Continent, and in the United States, guns with external hammers, except of a very cheap class, are manufactured as rare exceptions to the rule.

Litigation has attempted to establish that the first successful hammer-actuated ejector mechanism, placed in the fore-end of the gun, was the Westley Richards, patented in 1884, and it has been the subject of a hard-fought battle, ending, so far, in the House of Lords, and the firm claim that the judgment established its validity and its superiority over mechanisms alleged to have anticipated it. With that opinion we have nothing to do. But it is the only ejector mechanism which has stood the long test of fifteen years of use. In principle it is an adaptation of the gun-lock mechanism. It has very few parts, and they are so strong that it is almost impossible for the ejector work to get out of order, except by a break of the mainsprings. The firm contend that the parts cannot be further reduced without additional friction. Unquestionably it is greatly to the credit of Westley Richards that they can claim three-fourths of the modern top-lever hammerless guns as made by any maker—to be the outcome of their ingenuity in introducing, first, the top lever, and then the cocking by fall of the barrels.

The responsible managers of this firm hold that the

question of fit is one governed purely by the shooter's individuality, and that the gunmaker's predilections and prejudices should have nothing to do with the matter, although they sometimes lead one maker to advocate straight guns, another bent ones, a third abnormal cast-off, and so on. The right length, bend, cast-off, and other essential points can only be decided by ascertaining from personal observation the shooter's physical configuration, and any peculiar habit that may affect his methods of handling and aligning a gun. Special knowledge of "fitting," and the methods by which it is to be done, Messrs. Westley Richards claim can only be acquired by experience: they think that adjustable try-guns are like any other excellent tools in the hands of a bad workman—useless.

Mr. Leslie Taylor writes to us on this important subject as follows:—

"Some people have erroneously ascribed to the try-gun the wonderful powers of an 'automatic fit-finder,' and so encouraged the belief that one had only to fire a try-gun at targets and a 'fit' was ensured, and perhaps straightaway another good shot was launched amongst the game—a fatal delusion, which many have discovered to their sorrow, for this incontestable fact remains—that, failing special knowledge in the fitter, the try-gun commits the most absurd blunders, and lands the poor fitter and the still poorer shooter into miserable fiasco, such as no haphazard choosing a gun from stock could ever have done. Many instances of this have come before Messrs. Westley Richards' notice. They say, and it was undoubtedly true in the days before the try-gun, that a gunmaker who understands his business can 'fit' a sportsman without a try-gun much better than a man with a try-gun and without the requisite knowledge: in fact, they go farther with their customers, offering them either the choice of fitting with or without try-guns: and in many instances, whenever a comparison has been suggested, the dimensions ascertained without the aid of a try-gun have been exactly confirmed by tests afterwards made with it."

We have previously mentioned that we have seen and shot the Westley Richards single-trigger gun. On each of the sears is fitted a sliding piece, capable of a longitudinal motion; the sliding piece on the right-hand

sear is lengthened forward in order that the firing hammer shall come in contact with it in the cocking of the gun, and thereby move backwards the sliding-piece on the right-hand sear into its position, ready to be acted upon by the trigger. This backward motion of the right-hand sear slide also brings back the left-hand sear slide, and places it out of the range of the intermediate trigger lever. This trigger lever, when the gun is cocked, comes directly under the stud of the right-hand sear slide, ready for pulling off the first or right-hand sear. The trigger lever is made to slide backwards and forwards by means of the thumb-piece (which is fitted through the trigger plate) for the purpose of firing either right or left barrel first--that is, when the thumb-piece is moved forward, it pushes



THE SINGLE TRIGGER.

back the slide which contains the trigger lever, and places the said lever under the stud of the left-hand sear slide, ready for firing the left barrel first. By the movement of the thumb lever backwards (at the will of the shooter), the trigger lever flies forward again into position for firing off the right barrel. In the trigger-box is fitted a small cam of peculiar shape, which is so attached to the trigger blade that when the trigger is pulled this cam moves in an opposite direction: the bottom part of the cam forms a stop for the sliding-piece on the right sear in its forward movement, and prevents this sliding-piece from getting past it until the trigger has been moved involuntarily, when the complete falling of the trigger allows the left-hand slide to move forward, and its stud then obtains

re same position as that which the right-hand slide has
 ist left.

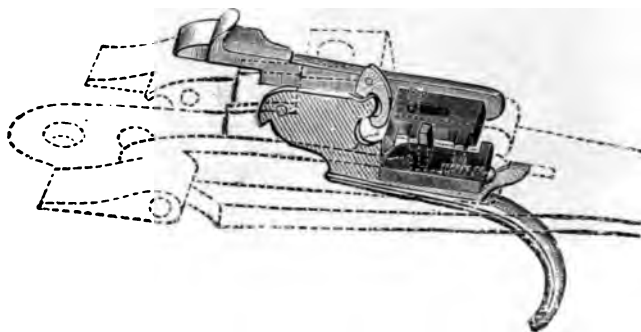


THE NEW SAFETY. - The pull of the right trigger as shown moves A back, and blocks the left trigger and tumbler sear C.

The sliding-piece of the right sear receives its forward
 movement from a lever and spring fitted in the action. The

sliding-piece of the left barrel receives its forward movement from a small spiral spring fitted in the sear tail. In firing the right barrel it is impossible for the right sear slide to get into its forward position until the trigger has made a movement, involuntarily actuated and consequent on recoil, which is certain to take place before the left-hand sear slide can get into its acting position.

This gun had been described to us as one of the three-pull kind. That is to say, that in snapping caps three distinct pulls would be necessary to get off both tumblers, and only two would be necessary when recoil was present to actuate the intermediate pull. This, as will be observed from the description given above, was not quite correct. The movement that recoil effects in this gun is not a pull.



THE SINGLE TRIGGER.

but a release only a partial release. This partial release is unconscious, and after it has taken place there must be a total release before the second pull-off can be effective. In our trials of the gun there was no failure, which proves that recoil was never enough to effect a total unconscious release of the trigger, although a partial release must have taken place. It is an error to call this gun one of the three-pull system therefore. Doubtless only experience in the field will settle its claims to favour finally, but, speaking for ourselves alone, we should have no hesitation in using a gun so made, and relying upon it with the greatest confidence. The selective action is not perfect, but then selective action is found not to be wanted by those makers who possess it.

This was written in 1897. Since then a good many of the single-triggers have found owners, and with one of them



THE DETACHABLE LOCKS.

Mr. Cave, winner twice in succession of the championship at the I.B.S.A. championship meeting, scored that event with one of these single-trigger guns in 1899.

A GREAT IMPROVEMENT.

There has always been a disadvantage in a body-actioned gun, inasmuch as there was no possibility, without the aid of special tools, of taking the gun to pieces so as to get at the locks. The first hammerless gun cocked by the fall of the barrels was the Anson and Deeley, and it is to this body-actioned gun that an immense improvement has been made twenty-three years after its first invention.

Formerly the woodwork had to be removed from the action before the locks could be reached for cleaning or repair. This defect in the Anson and Deeley was less than it seems, because the action was in so few parts, and was so strong and so well protected from wet that there was but seldom a necessity for taking a gun to pieces to get at a defaulting lock. The new improvement, the invention of

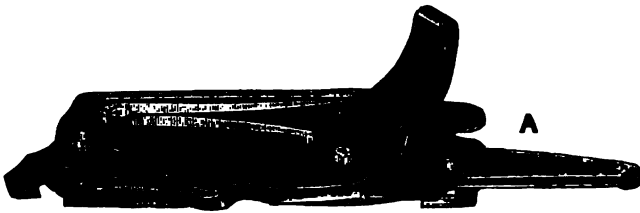


FIG. 2.

Mr. Leslie B. Taylor and Mr. John Deeley, is that the under plate comes off upon the pressure of a spring clip. The first figure shows one of the locks being removed from the body. It slides in or out, and there is nothing but the removed plate to keep it in position in the slot made for its reception. The second figure represents the lock, with the sear, striker and cocker all turning on pivots, which instead of being fastened into the lock plate are bored out of its solid steel. The third figure shows the removable plate with Westley Richards' spring catch.

The lock plates and the pivots are then one piece, and each of the pivoted pieces can be removed and replaced without tools, as they simply slide on to the pivot and are held in place only when in the slot of the body prepared for their

reception. The Anson and Deeley ejector gun thus improved is an exceedingly handy affair, and one that it would be difficult to entirely cripple. It is one of those guns so designed as to be as easy to put together when the tumblers are down as it is when they are in the cocked position. Thus the springs are never damaged by strain when the gun is in its case. We are glad to be able to compliment Messrs. Westley Richards upon an improvement of the greatest importance, especially to those who are not always within reach of a gunsmith. The appearance of the weapon is not altered in any way, nor is its working, with the exception of the division of main springs.



FIG. 3.

This firm has taken an interest in the Mauser self-loading pistol, believing in its suitability for military purposes, and Mr. Leslie B. Taylor has added an improvement in the shape of an Interchangeable Wind-gauge Peep and V-sight for fine shooting.

The pistol is adopted by the German military authorities, and sighted by them up to 500 yards. Its accuracy has been demonstrated. Even at 20 yards it is considerably more accurate than a revolver, and the difference increases with distance. The weight of the bullet is 85 grains, the muzzle velocity 1395 feet per second ; the muzzle energy, therefore,

is greater than that of the service man-stopping revolver bullet, viz., 367 foot-lbs. as against 318 foot-lbs., but the absence of "setting up" of the nickel-coated, and even of the soft lead bullet, has been thought to be detrimental, and that it would fail to quickly disable an enemy, who would live long enough to do the damage he came for.

The following extract from Wedekind's Correspondence. on June 6th, 1899, does not bear out this view :—" Yesterday there arrived in Berlin, from Kiao Chow, Lieutenant Hannermann of the Marines, who has gained celebrity from his daring and successful expedition, carried out in company with a mining Engineer, in the course of which, when surprised by robbers at I-chou-fu, he killed with the Mauser pistol, in a few seconds, seven Chinese, and wounded several others." Another, from Oudh, was that of a District Superintendent of Police, who, in an encounter with Dacoits, killed three, and wounded others with his Mauser pistol, to the possession of which he attributes the saving of his life, which with the ordinary army revolver he affirms he would have lost. He ridicules scepticism of its stopping powers, and says that their surgeon never saw such dangerous wounds, —one bullet struck a man's knee, smashing the joint, travelled up through his thigh and entered his bladder. Nevertheless, with a view to remove the only possible objection to the adoption of the Mauser pistol as a military arm, viz., the fear of lack of stopping power of the bullet, Mr. Leslie B. Taylor has invented a new form of bullet, which makes a larger hole in flesh, viz., $\frac{3}{4}$ in. in diameter, or as large as that made by the man-stopping service revolver bullet, and is accurate to 200 yards at least. The aim has been to make a bullet that does not split up into disunited particles, but one that against a hard substance mushrooms.

CHAPTER XXXVI.

ON THE LOADING OF CARTRIDGES WITH VARIOUS POWDERS.

THE first necessity to a well-loaded cartridge is a good cap and a good case. There is no method of cap testing within reach of the generality of sportsmen, and they are obliged to judge by results only. No badly-served sportsman in the field knows to-day whether it is his powder or his caps that are wrong. It is not easy to tell. Different powder cannot be loaded into already loaded cases for a trial of the powder charge by comparison, because the turnover would be soft for the new powder, and so much depends upon this with nitro-powders. It is true that the charges can be drawn and put into other cases, and if these are found to shoot better it is safe to conclude that the caps of the drawn cartridge cases have been in fault. Faults of cartridge cases can generally be detected by inspection: faults of powder and caps cannot, so that it is safe to treat an unsatisfactory batch of cartridges as having something wrong with the cap or the powder, or less often the wadding.

It has sometimes happened that when cartridges have been wrong the powder has been unjustly condemned, when all the time the fault lay in the caps. Anyone who draws the load and puts in black powder in place of a nitro is pretty certain to come to the conclusion that the fault was in the powder. But as nitro-powder requires a very hot flash to ignite all the grains simultaneously, and almost any bad cap is equal to the proper ignition of black powder throughout its bulk, it is very easy to see that a cap that might answer perfectly well with black powder would be of no use whatever for any nitro in the market.

Mr. Griffith has estimated that the man who desires to thoroughly exhaust the testing of possible variations of loads would have his work cut out for fifty years, and that, in view of new inventions, he would then stand a good chance of being further behind than when he began. We are very fond of testing various powders, shot, wads, caps, and cases, but we never come away from such a trial without conjuring up in our forecast of the future endless future trials each one of which will establish the truth, or untruth, of some theory of our own. But each one is to be differently conducted according to the result of its predecessor. It is easy, therefore, to understand that sportsmen who make the utmost use of what others have done are the wisest in their generation.

We have no intention of repeating long lists of figures in order to prove what we are about to say; we think that it is more material to the proper understanding of the once simple subject to state the principle on which loading should be based, and go to the makers of individual powders to be informed of any variations from the broad principles demanded by them for their respective powders.

We constantly have heard it stated that nitro-powders are quick powders; that is, that the explosion is quick. It has been the effort of the powder makers to catch up fine grain black powders in this respect, but nitro-powder even now is slower than No. 4 black powder, and much slower than No. 2 black. No. 6 black powder is as quick of ignition as either of the others, but it is slow of combustion, by reason of the size of the grains, which take time to burn through.

Nitro-powders are all slow of ignition, and they are mostly quick of combustion. The best patterns are to be obtained from some nitro-powders by reason of this slowness. The condensed nitro-powders are the quickest of ignition by reason of the greater average closeness to the cap. In experiments we made years ago we found that the flash of the cap then used for nitro-powders would not ignite them, without a prolonged hangfire, when they

were removed from the flash hole by a layer of sifted charcoal, nearly equal in length to the space usually occupied by the powders in the cartridge case. Since then the heat of the cap's "flash" has been increased, and now the results of such experiments as we then conducted would not be so extraordinary. At the same time we discovered this: if the cap was primed with a granule or two of black powder then ignition of the nitro with the charcoal between, as before, was not delayed. But if some of the characteristics we then discovered (sixteen or seventeen years ago) have been removed by the improvements of powders and of caps, some of them remain. There is, then, vastly more latent power in a charge of nitro-powder than is or ought to be brought out by any cap, and this anyone can try for himself by priming with black powder, having, of course, taken due precautions against accident by reason of a burst gun.

Heat or drying of the nitro-powders has the tendency to make them more easily ignited. Heat has more effect than drying (we suppose because it renders the powder nearer to that state in which spontaneous combustion takes place). Black powder is not subject to these fluctuations any more than it is to variation by reason of imperfect ignition. Possibly the combination of nitro-cellulose with nitro-glycerine first got over the difficulty with nitro-powders of variable trajectories, consequent on various ignition. Of this class Cordite and Ballistite stand alone. But if, at one time, they greatly exceeded pure nitro-cellulose powders in regularity, they do so no longer. And the match rifle competitions at Bisley are not, as a rule, won with cordite and the '303, but with Mannlicher rifles and foreign-made powder.

At the same time the nitro-glycerine powders are lower pressure powders than any nitro-cellulose powders, and although rifleite is the best English rifle powder other than black on the market, its pressures are somewhat higher than those of cordite. The nitro-glycerine powders, however, have one very bad fault. They rust the barrels quicker than other powders do, according to the opinions

of not a few gunmakers who have the after effects to take out of the barrels. Cordite, however, as well as ballistite, have the advantage of lending themselves to the same principle that governs the rate of explosion in black powder. The size of the grain or the cord of Cordite regulates rapidity. Rifleite is more or less regulated in the same way, and in fact it is correct for any condensed powder of the solid, non-porous kind. It would not be of much use to try and regulate a porous powder by the size of the grain; and although the latest fashion is to coat each grain with a substance, waterproof under some conditions of manufacture, we doubt whether powder partly dissolved in ether-alcohol really makes a waterproof substance when it sets upon a porous one. Even the powders which are supposed to be dissolved throughout their bulk, such as shot-gun Rifleite, have fibres still left undissolved, although it requires a microscope to see them. Amberite, E.C., Schultze, and Kynoch are the porous bulk powders for shot guns. Shot-gun rifleite, Cannonite bulk and condensed, Ballistite and Normal, are the best known of the gelatinised waterproof kind; some of which, notably E.C. No. 3, and Cannonite No. 2, are not condensed in bulk.

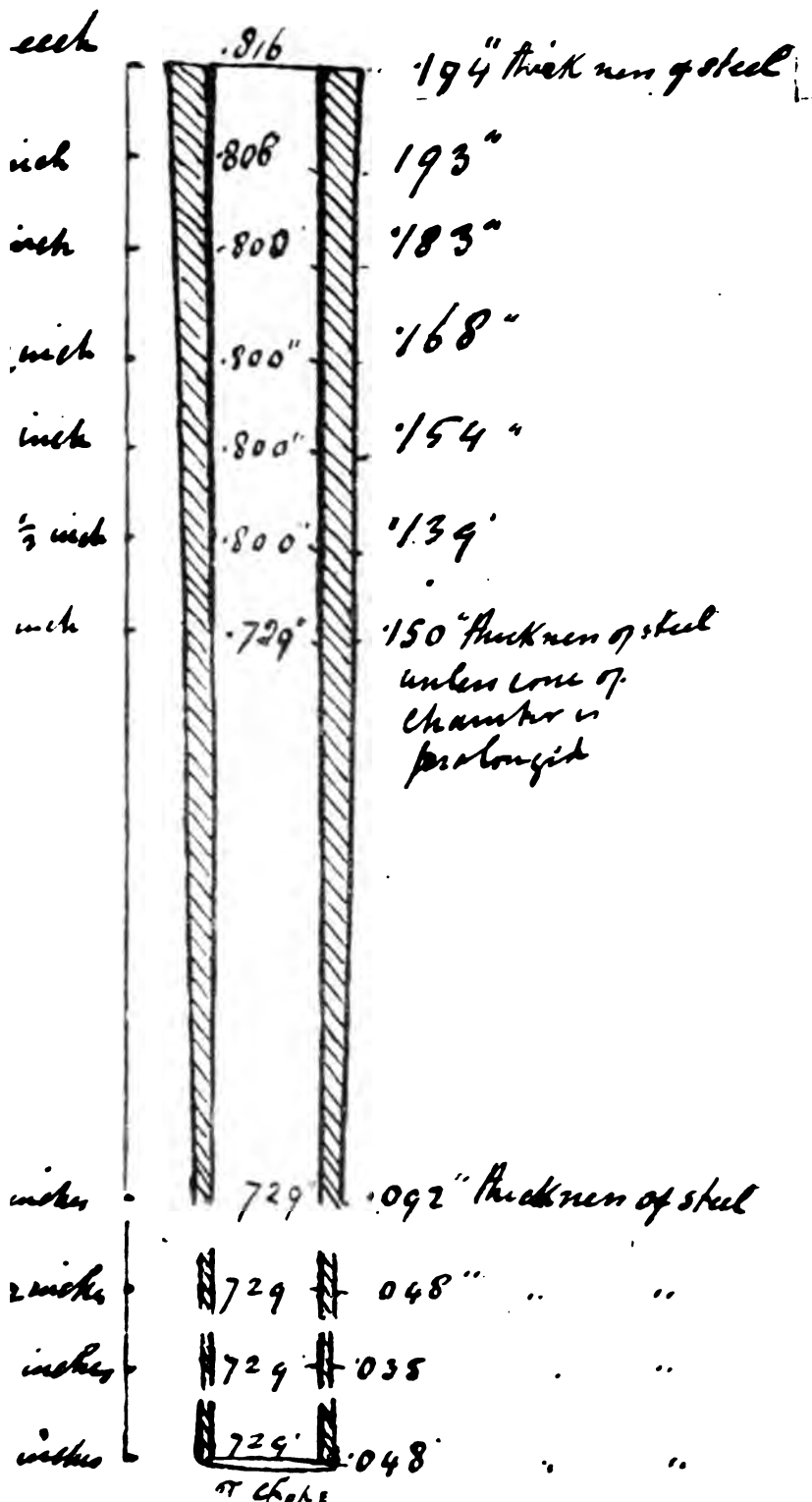
Coopal, when we tried it last, was a porous powder, very subject to fluctuations, and Walsrode is a condensed powder, with which, outside of Mr. Lancaster's unsatisfactory pigmy cartridges, we have only had a few experiments. Van Forster was a powder that gave low pressures and high velocities, but it seemed to us to carry slow ignition to an extreme point. We must always remember that if a powder gives very low pressures and high velocities, as a consequence of slow ignition, it has in it greater latent force than quicker powders giving the same velocity. Having the latent force, it depends upon the cap, the heat, or the dryness of the powder whether or not it maintains its normal pressure or suddenly converts its latent force into barrel pressure. In other words, given equal velocities, the more a nitro-powder depends for its low pressures upon slow ignition, the more danger it carries with it. Most of the porous powders in common

use are slow of ignition: their time varies, from the fall of the hammer to the shot leaving the muzzle, from about .005 of a second to .008 of a second, but as we have had these with us for over twenty years, we may feel very safe with them. But if powders are so slowed down as only to give less than a ton chamber pressure (as the *Field* stated that Van Forster did) with regulation velocity, then it is probable that somewhere in the barrel there must be higher pressure than in the chamber, and *also* certain that the latent strength of the powder is infinitely greater than that of powder with normal chamber pressure (of about $2\frac{1}{2}$ tons per square inch) which gives only the same velocity.

In reference to the condensed powders it may be said that if you pack the same latent strength into half the space you stand chances of developing double the pressure. Luckily, the turnover is so light that the strength of the cap can undo it, and this possibly it does before the body of the powder is well alight. It may be said that as you decrease the space occupied by the powder you bring it nearer to the cap, and ignition is, therefore, quicker. That is no doubt true, but at the same time there is less room for the cap-flash gases to circulate, and they therefore have greater effect on the turnover. There is no doubt that a nitro-powder can only give very low pressures when the cap energy is strong enough to unroll the turnover and move the shot before total ignition of the powder. In order to accomplish this a cap flash would require great energy and little heat. But it is not good to rely upon large quantities of fulminate of mercury, and if the tendency was in this direction, which, luckily, it is not, it is well to consider what would happen when, by chance, condensed powder got into cases with exact contrary caps — those with little energy (not enough to move the wadding) and much heat (enough to ignite the whole charge simultaneously).

In practice there is not much difference between the internal barrel pressures given by any of the nitro-powders now much in use. That is so because the aim has been

SIZES AT VARIOUS POINTS IN TWELVE-BORE BARRELS.



constantly to quicken the powders, and always to intensify the igniting powers of caps. To say that a powder gives regulation velocity (about 1,200 f.s.) with a chamber pressure of under a ton, and to approve of a powder that would do this, would be equivalent to advocating barrels as thick at the muzzle as at the breech, or a total revolution in gunnery. It requires very nearly a mean pressure of a ton throughout the length of 30-in. barrels to give a velocity of 1,200 f.s. to $1\frac{1}{8}$ oz. shot. Consequently when there was less than a ton in the chamber it is obvious that pressures must be the same all up the barrel, or else greater in some part other than the chamber: that is, greater where the barrel is thinner.

At present barrels are made to receive and resist the greatest pressure in the chambers where the metal is about .194 of an inch thick, whereas 21 in. from the false breech they are only about .035 of an inch in thickness. That is, they are nearly seven times as thick in the breech as they are in the weakest part of the barrel. It is clear, therefore, that for the sake of safety we must have powders the pressure curves of which vary as the metal in the barrels, or something near it.

But although nitro-powders are not very sensitive to the flash of the cap, they are apparently as sensitive as black powder itself is to the flash produced from the first fired grains of powder. We find that some of the bulk nitros do not set up a movement of the shot of 100 ft. per second at 3 in. from the breech, whereas No. 2 black powder sets up a velocity of about 250 f.s. at that point in the barrel. But at 6 in. the two are about equal and remain so throughout the length of the barrel, so that at 6 in. they have given a velocity of 550 f.s., about 900 f.s. at 12 in. from the breech, about 1,100 f.s. at 18 in., and 1,250 f.s. at 24 in. from the breech. The pressures, moreover, when these velocities were taken were very nearly equal for 6 in. of the barrel for some of the nitro-powders: only differing by $\frac{1}{3}$ of a ton per square inch between the breech and 6-in. plugs. But No. 2, black, gave differences between the two points of 2 tons (two tons). No. 4, black.

a difference of 1 ton, and No. 6, black, a difference of '6 of a ton. But these experiments, like the others, are several years old, and later trials teach us that nitro-powders have been approaching nearer and nearer the characteristics of black powder. Thus instead of having breech pressures as of old of about 2 tons per square inch and less, they are now about $2\frac{1}{2}$ to 3 tons per square inch, probably in consequence of the improved caps. These velocity experiments were made by the *Field* in 1895, and they are not absolutely reliable, although they may be relatively so. They are not absolutely reliable, because at 24 in. from the breech they record a higher velocity than there is at the muzzle instead of a lower one. The results given were quite 100 f.s. too high; and they are only useful therefore in conjunction with confirmatory and independent testimony. These, including results obtained by Mr. Griffith, of the Schultze Company, with his own powder [to an extent condemnatory of it as time lost] go to show that we may rely upon the difference of rate of movement of the shot (up to the third inch) between nitro-powder and black. Other experimenters have found that the times in the barrel vary between black and Schultze between $\frac{5.0}{10.000}$ of a second for nitro and $\frac{2.5}{10.000}$ of a second for black, the black being the quicker, and that porous nitros are about at their best when they only take $\frac{2.5}{10.000}$ of a second longer than the black to get the shot out of the barrel. The time lost, as may be seen by the different rates of travel of the shot up to three inches, is in the ignition of the powder; and if we refer to the cap-testing experiments recorded in another chapter, we find that the power of the cap flash is enough to move the shot at the rate of 100 f.s. or thereabouts; so that it is doubtful whether that rate of movement is at all due to powder.

As it is impossible to alter all the barrels in use to meet the requirements of any powder, however good, powders must be accommodated to the shape of barrels.

The diagrams (pages 526, 527) illustrate the walls of the barrels of guns, as used by the Birmingham Proof-House

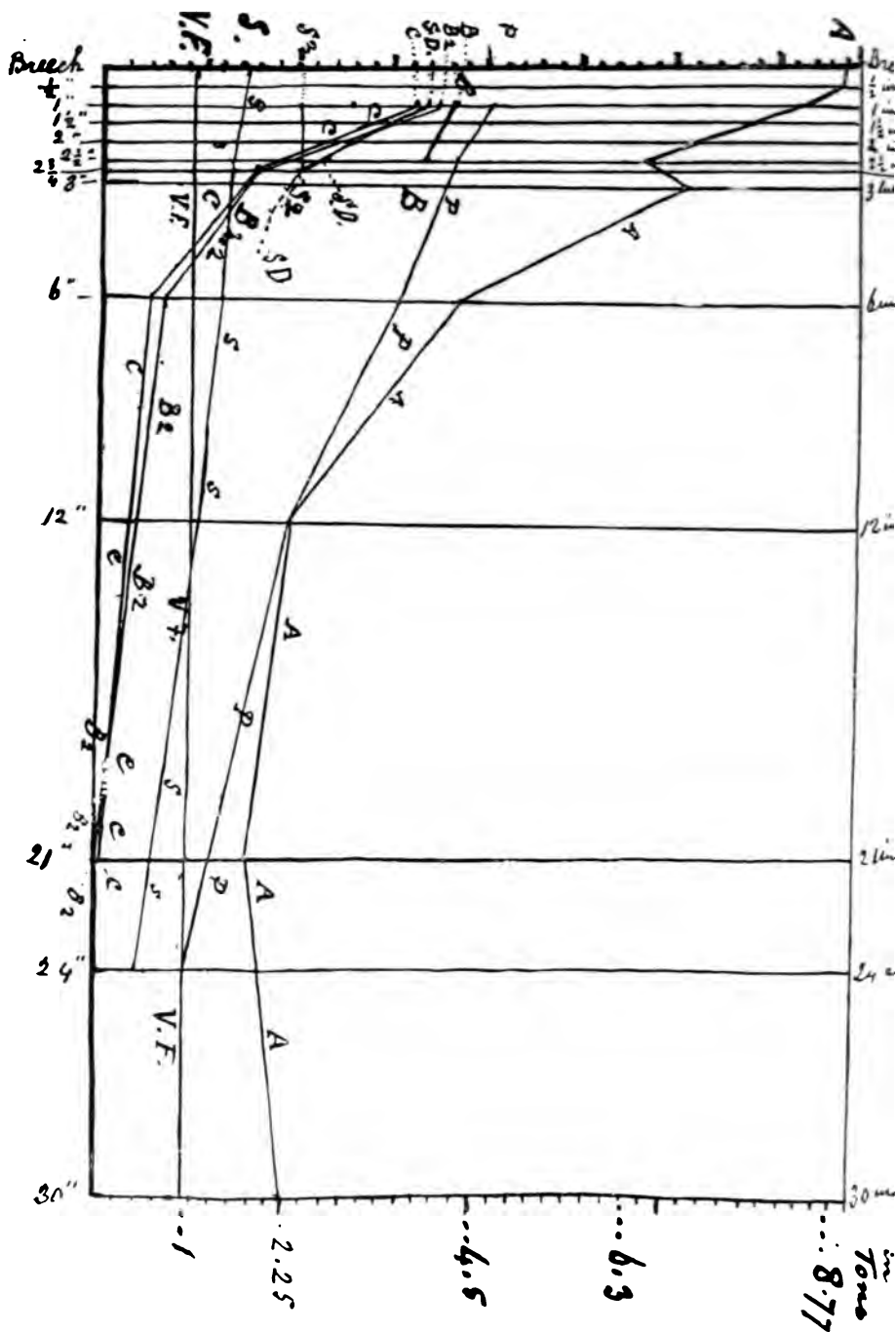
in their exhaustive tests of barrels of various kinds, and it may therefore be taken as the standard. We have given the first six inches complete, and added afterwards three sections of the barrel at the places measured by the proof authorities in the trials alluded to, viz., 12 inches, 21 inches, and 30 inches from the breech. We have added an ordinary-sized chamber: the barrels were tried without them.

For comparison with these sections of the walls of the barrels we have tabulated some pressures obtained at various points in the barrel at various times. We do not consider any of them, or any others, accurate, but they are doubtless comparative with themselves. That is to say, it is safe to take the pressures at the breech and compare them with the pressures elsewhere, and when their relationship at the various points is discovered it is safe to compare them with their equivalent points in the walls of the barrels to see whether pressures correspond in ratio with thickness of metal at the various parts. Proof pressures go to show that most pressures obtained from sporting charges are safe; but unless the thickness and thinness of steel correspond to the rise and fall of pressures at various points it goes without saying that if there is not danger at one point there is too much weight to carry at another. In one corner of the journalistic town we are constantly being recommended to use powders that give light breech pressures, but a glance at the pressures given by Van Forster powder [according to the *Field*] shows the danger of the advice. If this powder did give a pressure under a ton at the breech then it could not have been far short of a ton at the muzzle, as in order to get a 1,200 f.s. muzzle velocity, a mean pressure (throughout the barrel) of 1,552 lbs. is necessary, and it is well to remember that proof powder falls below a ton pressure at the muzzle. In some experiments carried out by ourselves and the late Mr. Allport, chairman, since master, of the Birmingham Proof House, in 1888, Schultze powder fell very much between the 3-in. point and the 6-in., but in later experiments

carried out by the *Field* the pressure at 6 in. was only a fifth lighter than at the breech ; whereas the steel of the barrels between the two points varies by more than one-half. Of course both pressures are well within the limits of safety ; they are in fact considerably too low to represent the truth, like all the pressures recorded by the *Field*, and very little more than half those claimed for the powder by Mr. Griffith, the trustworthy maker of the powder.

We do not give the whole of the plug records in the 1888 trials. They were the first ever held to test shot guns at six various points in the barrel, but unfortunately they do not all correspond to the points of measurement in the 117 barrels that underwent the exhaustive tests at Birmingham. Indeed, very few pressures have been taken that do exactly correspond to them. In the cases that gave the high pressures from Mr. Woodward's loading, the brass of the ejector cases was, we understand, ordered to be longer than normal. This resulted in its being slightly pinched in the turnover machine. There was no crimp or any indication that the metal had become smaller by pressure until they were very closely examined and measured, when they were found to be curved very slightly inward where the brass joins the paper turnover.

Sir Frederick Abel has stated that in a closed chamber 40 tons per square inch pressure can be got out of any charge of black powder *independent of its size*. We cannot believe this, for although we do not doubt the pressure for large bulks, yet for small ones we do. Six one-square-inch walls contain but one cubic inch of powder, 1,000 cubic inches of powder require but 600 square inches to contain them in 10-inch-square sides. The bulk of powder compared to the superficial area of the walls is in the large charge as 1,000 to 600, and in the small charge as 100 to 600. Whatever the utmost pressure either can give per square inch upon its walls, they must be very different. Large as they undoubtedly are, much greater pressures can be got out of



A DIAGRAM SHOWING RESISTANCE OF STEEL COMPARED TO PRESSURES OF POWDER

nitro-powders, and it goes without saying that turnover when too much is one of the surest ways of bringing out the chamber pressure of the powder. Yet even a pressure of four tons at the breech is well under proof pressure and is safer, in our opinion, than pressures which are so low at the breech that they have to be nearly or quite as high at the weakest part to get up the velocities to the regulation speed. We would not elect to shoot with cartridges that gave a 4-ton pressure at the breech, but we know the worst of them at any rate; but when a powder gives a pressure of less than a ton at the breech, we know that it must give near about proof pressure at the muzzle, and that its latent force is very high indeed. Then, if there is an accident in loading, such as happened to Mr. Woodward's cartridges (long since withdrawn), what will happen to the gun or the shooter? *

EXPLANATION TO TABLE.

(Dotted lines are only inserted to show which index letter a certain line belongs to.)

A—Represents the curve of the thickness of metal of the walls of the barrel at various points on the lines laid down by the committee appointed by the Birmingham Proof-House Guardians.

P—Represents the true curve of proof pressure brought into relation-ship with the resistance line above. The least excess of resistance over proof pressure occurs at 12ins. from the breech; we do not know how much that is. It is only known that any barrels in use have not burst in proof. It is, therefore, safe to assume that the resistance and the proof pressure are equal where they come nearest together, and then see how they diverge at other points in the barrel. The curve of resistance is based on the thickness of .194ins. at the breech, and the same measurements throughout as the Birmingham Proof-House experimental barrels; with the exception that a usual chamber has been allowed for.

B (4·10 tons)—Represents the curve from 1in. to 2½ins. of some badly loaded nitro cartridges with the brass pinched in at the turnover

* With reference to these cartridges, we have omitted the name of the powder, because although, when the facts were first published, we expressly stated that the powder was in no way in fault, but that the cases alone were to be blamed, yet we find that, after all, some people did throw blame on to the powder, where none was intended or deserved. We only published the fault at that time, as now, in order to draw attention to the extreme necessity of caution when variation from ordinary loading is desired. Experiments such as an extra turn-over, extra length, or decreased length of case can only safely be indulged in by those who have, at hand, scientific instruments to check them.

(ordinary charge and $1\frac{1}{2}$ oz. shot), and as the same load normally gives 2.20 tons, we see what an erroneous length of brass of the ejector cartridge, when the metal is slightly pinched in by the turnover, will do. It is noteworthy that it gives very nearly proof pressure under such circumstances, and also that it follows the same angle as proof pressures as far as it was measured; although this 4.10 ton pressure, therefore, is far under the curve of resistance, it stands some chance of meeting it at the 12ins. point where proof-pressure meets it. It must not be forgotten, also, that 4.10 tons was the average, not the highest pressure, with the Woodward improper ejector cartridges. The highest was 4.78 of a ton, or higher than proof pressure, whereby if the curve (or angle of decrease) was the same as that of proof powder, it would have risen higher than resistance of the barrel at the 12ins. point. That the gun did not burst was, therefore, because it had a greater strength than the proof guaranteed. We believe that any nitro-powder loaded in the same way would give the same results.

B2—Represents the curve of pressure given by 3drs. of No. 2 black and $1\frac{1}{2}$ oz. of shot.

C—Represents the curve of pressure given by Coopal 40grs. $1\frac{1}{2}$ oz. shot.

S D—Represents the curve of pressure given by 42 grs. of Schultze (1887) dried for $1\frac{1}{2}$ hours at 160 F., and $1\frac{1}{2}$ oz. shot.

[It will be seen that these three last curves are totally dissimilar to that of proof powder, but that they are very near indeed to the curve of resistance of the barrel up to 21ins. where the two former records cease, and up to $2\frac{3}{4}$ ins. where the last ceases.]

S2—Is the curve of pressure, upwards slightly, from 1in. to $2\frac{3}{4}$ ins. of 72grs. of Schultze powder and $1\frac{1}{2}$ oz. of shot.

[It will be seen that in spite of the nearly double charge the pressure was less than with the dried Schultze. This also was an 1887 trial, and Schultze, like most nitros, has been rendered less susceptible to influence by heat and drying since then: but, as we have before stated, all nitros are greatly influenced by heat and drying. Black powder is in no way changed by this amount of drying:]

S—Represents an 1895 *Field* test of Schultze powder. It gives very low pressures: and must have been loaded with case-charged with caps of poor ignition power. As will be seen by the way its pressures are retained up to 24 ins., it was capable of giving much higher breech pressures had it been quickly ignited.

VF—Represents a ton per square inch from beginning to end. Probably this is impossible, but when the *Field* stated that the pressures of Van Forster were all under a ton with regulation velocities, something very like this absence of curve must have taken place. Proof pressure meets and passes below it at 24 ins. from the breech. Nobody would think at first glance that there was more danger from a powder which gave but a ton per square inch chamber pressure than from one giving $3\frac{1}{2}$ tons, but there is, because it is the habit of gun borers to make guns of a resistance somewhat similar to the resistances in the instance taken, and they do not follow the lines indicated by proof pressures in the making of their barrels. It may be said that the slower burning powders follow the curve of proof powder, and sometimes meet and cross the curve of resistance, but that the pressures of the quick ones follow the curve of resistance, and yet never approach it at any point in the barrels. A gun built on these lines, and having passed proof, is capable of resisting a per square inch pressure of 8.77 tons at the breech, in spite of the fact that proof pressure there is only about 4.50 tons per square inch. That is if the metal is equally sound throughout.

It will, we think, readily be admitted that, as guns are built to the curve A, powders should follow that curve as nearly as possible. There are several reasons besides that of danger to the middle of the barrels against going for slow powder. First of all, if the curve of pressure of slow powder (see S.) was followed in the barrels, proof would follow that curve also as it does now. Then if the same powder happened to be treated as in S.D., or in any other way that would give to it simultaneous ignition, it would at once be a case of no guarantee of safety from proof.

Of course, any pair of barrels may be largely in excess of the margin of safety shown here, but there is no guarantee of it beyond the proof of a gun.

Then there is the question of weight. It may well be asked why we should carry more weight in any part of our barrels than the necessity of safety, as shown by proof, demands. If we took the curve of proof and made that also the curve of resistance of the walls of the gun-barrel

we should have to increase the proof test as well as the thickness of the barrels at 12 in. from the breech, because it would clearly be unwise to lessen the thickness of the breech, seeing that a little extra turnover will at once make an ordinary load give more pressure than proof charges do. The alteration of the resistance curve to proof pressure curve would, therefore, increase weight at 12 inches enormously, and would throw any gun out of balance. It is clearly impossible to alter the resistance curve to that of the proof charge, and that being so, slow powders which follow the roof curve are a mistake.

But if we cannot alter the barrels it appears desirable that the proof authorities should alter the proof charge in a way to make it follow the curve of resistance. If we admit that the proof at 12 inches is satisfactory, as it is, and that the curve of resistance and the curve of pressure meet there, it does not follow that every pair of barrels has in fact the excess of resistance shown in the diagram.

The thickness of metal given shows a resistance equal to 8.77 tons per square inch, but there may be a flaw in the metal, and its utmost resistance may be exactly equivalent to the pressure of proof powder after all. Suspecting that any nitro charge may be made to develop over 4.50 tons per square inch even when loaded by a crack gunmaker like Woodward, we cannot agree that proof charges are as good as they might be. The supplementary proof is only for guns *declared* to be intended for nitro powders. Besides, not being compulsory, it is not a very high proof, as $4\frac{1}{6}$ drachms of No. 2 black powder (T.S. 2) and $1\frac{2}{3}$ oz. shot is not a high charge, although it puts the pressure in the right place, corresponding to the curve of resistance in the metal of the barrel. By Rule 46 of the proof regulations when a gun has been proved in this way it is to be marked as follows, "nitro proof oz. maximum," indicating the service weight of shot to be used. Barrels can be proved with any of the nitro powders that are ordered to be used, but as the limit of the strain put on is only between 80 and 100 per cent. in excess of that of the service charge, it is not as good and

useful a proof as the old regulation No. 6 black. The normal pressure of most nitros is low, under normal conditions ; but vary those conditions but slightly, and the powders do not confine themselves to increases of 80 to 100 per cent. pressures, as has already been shown. It seems to us that all the proofs are inadequate, and that our greatest safety, after all, lies in the fact that from the 12in. point the curve of resistance of the metal of good barrels rises greatly towards the breech in a greater degree than the curve of pressure of proof powder rises from that point where the two meet ; and where, in most cases, service charges give light pressures. What it really amounts to is this : we rely on ordinary proof to show that our barrels are sound at the 12in. point, and we rely upon the gunmaker to give us plenty of metal in the breech to meet the nitro emergencies. It is an arrangement that has not, on the whole, answered badly.

That barrel-makers do not rely much upon proof was established by the guardians of the Birmingham Proof-House itself in the trials of 39 different sorts of barrels in 1888, to which we have already alluded. These 39 sorts were represented by three barrels for each, and the committee appointed reported in 1891 that all but one set of three had stood definitive proof, and that none bulged to the extent of 1-100th of an inch until it had withstood a strain 5·74 times greater than that of definitive proof. All the barrels were nevertheless turned down to the size indicated in the diagram, except that they had no chambers.

It was objected at the time of the publication of these tables that they were of no value because they did not indicate the extreme bursting point or "ultimate stress" of the barrels. No doubt the details would have added greatly to the value of the tables, but to say they were useless because they were averaged, and because a bulge of $\frac{1}{100}$ can be knocked down by the gunmaker, is going very much too far. Indeed, no article on the safety of guns and the proper loading of cartridges would be complete without this report, which we accordingly now repeat. It will be seen that the bulge did not occur in any of them until the strain put on was 5·74 times greater than proof

strain, and in some of them it did not occur until it had reached 12·59 times proof strain (definitive). But 12·59 times 4·50 tons, which is accepted as proof pressure, is 56 tons per square inch, and we have Sir Frederick Abel's word for it that 40 tons per square inch is the extreme pressure of black powder in an absolutely closed vessel. There seems to be a little mistake in the figures, which cannot be read as absolute figures, but merely comparative ones.

It will be noted that the report states that the bulges and bursts did not occur within 6 ins. of the breech, but between that point and the 24ins. point, and this is exactly what the curve of proof pressure and the curve of resistance depicted herewith would lead us to suppose.

" A REPORT UPON TESTING THE STRENGTH OF VARIOUS KINDS OF GUNBARRELS, ALL MADE TO THE SIZE INDICATED IN THE PRECEDING DIAGRAMS.

"The Board of Guardians of the Birmingham Proof-House having by resolution, dated January 26, 1888, appointed a committee to test the strength of the various kinds of English and foreign barrels employed in sporting guns, the said committee was composed of the following gentlemen (elected Guardians of the Birmingham Proof-House) as being fairly representative of all departments of sporting gun manufacture: Messrs. S. B. Allport, C. G. Bonehill, E. James, W. M. Scott, T. Turner, jun., and T. W. Webley.

"The committee at its first meeting sent an invitation to all classes of makers of barrels ordinarily employed in sporting guns to contribute barrels for the purpose. They also purchased from the best foreign makers, or their agents, samples of the same. The samples supplied were as follows:

- " First—English twisted hand forged: three specimens.
- " Secondly—English twisted machine forged: seventeen specimens.
- " Thirdly—Foreign twisted barrels: six specimens.
- " Fourthly—English steel: eleven specimens.
- " Fifthly—Foreign steel: two specimens.

" In all thirty-nine specimens, of different kinds: in all 117 barrels.

" These were received in the rough-bored and ground state. The rough tubes were first set, then touched in a lathe in several places in order to make them quite concentric, and ground true to gauges: then fine-bored and struck up to gauges, and lapped inside to a plug

to exactly the same calibre, viz., $\cdot 729$ of an inch. Finally they were mounted on a cylindrical mandril of the exact calibre, and spun on dead centres in a lathe, so as to satisfy the committee that they were absolutely concentric.

"The length of each barrel was 30in. The external dimensions were: At breech, $1\cdot 205$ of an inch; at 3in. up, $1\cdot 03$; at 6in. up, $\cdot 913$; at 12in. up, $\cdot 826$; at 21in. up, $\cdot 800$; at 30in. up (being the muzzle), $\cdot 826$. The weight varied slightly, according to the density of the different materials, but approximated to 1lb. $9\frac{1}{2}$ oz. per tube.

"Three several barrels of each specimen were numbered, as— $1/1$, $1/2$, $1/3$; $2/1$, $2/2$, $2/3$; $15/1$, $15/2$, $15/3$; $33/1$, $33/2$, $33/3$, etc.

"The committee resolved that as soon as a barrel exhibited such a bulge as would cause its rejection by the proof-master, it should be *rejected*. The barrels were then wiped out and breech plugs were screwed in, having touch-holes all of one size, namely $\frac{1}{32}$ nd of an inch diameter. They were loaded first with the definitive Proof-House charge applicable to the calibre—namely, 182grs. of Proof-House powder: then a wad of paper felt about $\frac{3}{4}$ ths thick over the powder: then 729grs. of No. 6 shot, and then the same kind of wad over the shot. The constancy of the strength of the powder was repeatedly checked. The wads would pass down by the pressure of the little finger on them, and were all cut with one punch. The ramming was done by machine, every one with a pressure equal to laying a 10lb. weight on the wad; not bumped at all. Every charge of powder and shot was weighed in grains, in very accurate scales, by two members of the committee to each kind: and the whole of the members attended the loading, ramming down, firing, washing out and viewing. All the barrels were mixed together indiscriminately, so that the various kinds were not known to the committee until after the viewing and rejection of the whole.

"Lots of eight barrels at a time were fired with a train of powder: they lay in a grooved bench and recoiled into sand. After being fired, they were washed out with hot water, and cleaned with oil tow: all signs of lead were removed with a wire brush. They were polished in and outside, and then viewed by the members of the committee, assisted by the proof-master, who thereupon decided whether a barrel had bulged so as to be perceptible, and to be rejected. After the view, and decision that a barrel had failed, the mark and number upon it was referred to, and the result was recorded. The individual barrels were proved with gradually increasing charges of powder and shot. The *first* proof was 182grs. of powder and 729grs. of shot. The *second* proof was 200grs. of powder and 802grs. of shot. The *third* proof was 220grs. of powder and 882grs. of shot. The *fourth* proof was 242grs. of powder and 970grs. of shot. The *fifth* proof was 256grs. of powder,

TABLE I.—COMPARATIVE RESULTS OF PROVING :9 GROUPS OF DIFFERENT KINDS OF BARRELS TO A "REJECTING" BULGE AT THE BIRMINGHAM PROOF-HOUSE.

No. in order of merit of entrance.	Register number of group.	Average cumulative grains of native grain of powder and shot each barrel endured.	Proportion of stress withstood : the definitive proof being 1 ton.	Ordinary price per pair of rough tubes in shillings.	NATURE OF MATERIAL OF BARRELS TESTED.
1	18	4,248	4.66	20s.	English machine-forged laminated steel, in three rods, improved economic compound coiling process.
2	33	4,227	4.04	90s.	English fluid compressed steel, Whitworth's process.
3	11	3,896	4.26	27s.	English machine-forged best Damascus, in two rods, improved economic compound coiling process.
4	30	3,667	4.02	24s.	English steel, Siemens-Martin process, rolled from a hollow mould; slightly harder than No. 29 group.
5	1	3,355	3.69	35s.	English hand-forged best Damascus, in four rods.
6	14	3,285	3.60	25s.	English machine-forged variegated Damascus, in two rods, improved economic compound coiling process.
7	10	3,443	3.56	20s.	English machine-forged best Damascus, in three rods, improved economic compound coiling process.
8	34	3,142	3.43	21s.	English steel, basic open hearth process, from hematite pig and scrap, carburised by Darby's filtration process.
9	19	3,052	3.35	24s.	English machine-forged laminated steel, in two rods, improved economic compound coiling process.
10	35	3,015	3.31	45s.	English steel, "superior barrel steel."
11	15	2,718	2.98	19s.	English machine-forged chequered Damascus, in three rods, improved economic compound coiling process.
12	39	2,648	2.90	24s.	Foreign steel, Siemens-Martin process.
13	31	2,471	2.70	24s.	English steel, basic open hearth process, from hematite pig and scrap.
14	13	2,441	2.70	22s.	English machine-forged variegated Damascus, in three rods, improved economic compound coiling process.
15	24	2,414	2.63	12s.	English machine-forged skelp twist.
16	2	2,314	2.54	31s.	English hand-forged best Damascus, in three rods.
17	29	2,280	2.50	24s.	English steel, Siemens-Martin process, rolled from a hollow mould.
18	7	2,047	2.25	15s.	Foreign "Pointillé" twist.
19	9	2,016	2.20	31s.	English machine-forged best Damascus, in four rods, improved economic compound coiling process.
20	16	2,010	2.20	25s.	English machine-forged chequered Damascus, in two rods, improved economic compound coiling process.
21	12	1,983	2.11	31s.	English machine-forged chequered Damascus, in four rods, improved economic compound coiling process.
22	32	1,046	2.11	24s.	English steel, basic open hearth process, from hematite pig and scrap, carburised by Darby's filtration process.
23	33	1,834	2.00	24s.	English steel, basic open hearth process, from hematite pig and scrap, carburised by Darby's filtration process.
24	25	1,612	1.77	31s.	English hand-forged best laminated steel, in three rods.
25	37	1,579	1.72	30s.	Foreign Damascus, "Crollé," in three rods.
25	3	1,579	1.72	35s.	Foreign Damascus, "Crollé," in four rods.
26	8	1,399	1.44	22s.	English machine-forged Boston Damascus, in four rods, improved economic compound coiling process.
27	5	1,245	1.37	18s.	Foreign Damascus, in two rods.
27	17	1,245	1.37	18s.	English machine-forged Boston Damascus, in three rods, improved economic compound coiling process.
27	40	1,245	1.37	24s.	Foreign steel.
28	21	941	1.00	14s.	English machine-forged iron Damascus, in two rods, improved economic compound coiling process.
29	23	638	0.70	13s.	English machine-forged fine skelp twist.
30	6	607	0.69	14s.	Foreign Boston Damascus, in two rods.
30	22	607	0.69	13s.	English machine-forged iron Damascus, single rod.
30	27	607	0.69	24s.	English steel, Siemens-Martin process, rolled from hollow mould.
31	4	304	0.33	20s.	Foreign Damascus, in three rods.
31	26	304	0.33	25s.	English steel, Siemens-Martin process, special mixture of Swedish and English iron, rolled from hollow mould.
31	28	304	0.33	28s.	English steel, best quality, Siemens-Martin process, from pure Swedish iron, drilled in full length.
32	20	000	000	14s.	English machine-forged Boston Damascus, in two rods, improved economic compound coiling process.

NOTE.—No. 33 was withdrawn, as only one pair was supplied. The figures in Column 4 refer only to the group having failed to stand the definitive proof.

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TABLE II.—COMPARATIVE ENDURANCE OF 39 DIFFERENT KINDS OF BARRELS BEFORE EITHER BURSTING OR EXHIBITING A BULGE EQUAL TO .01 OF AN INCH, OR AN INCREASE OF FROM .729 TO .739 DIAMETER.

Order of merit in TABLE I.	Classes in order of merit of endur- ance, TABLE II.	Register number of group.	Average cumu- lative grains of powders of each barrel endured.	Proportional stress withstood; the definitive proof being 100.	Ordinary price per pair of tuns in shillings	NATURE OF MATERIAL OF BARRELS TESTED.
4	1st	30	11,571	12.59	24s.	English steel, Siemens-Martin process rolled from a hollow mould; slightly harder than No. 29 group.
6	"	14	11,571	12.59	25s.	English machine-forged variegated Damascus, in two rods, improved economic compound coiling process.
10	"	35	11,571	12.59	45s.	English steel, "Superior barrel steel."
12	"	39	11,571	12.59	24s.	Foreign steel, Siemens-Martin process.
19	"	9	11,571	12.59	31s.	English machine-forged best Damascus, in four rods, improved economic compound coiling process.
20	"	16	11,571	12.59	25s.	English machine-forged chequered Damascus, in two rods, improved economic compound coiling process.
27	"	40	11,571	12.59	24s.	Foreign steel.
8	2nd	34	10,720	11.77	24s.	English steel, basic open hearth process, from hematite pig and scrap, carburised by Darby's filtration process.
31	"	26	10,720	11.77	25s.	English steel, Siemens-Martin process, special mixture of Swedish and English iron, rolled from hollow mould.
2	3rd	38	9,909	10.88	90s.	English fluid compressed steel, Whitworth's process.
24	"	25	9,909	10.88	31s.	English hand-forged best laminated steel, in three rods.
3	4th	11	9,869	10.83	25s.	English machine-forged best Damascus, in two rods, improved economic compound coiling process.
14	"	13	9,869	10.83	19s.	English machine-forged variegated Damascus, in three rods, improved economic compound coiling process.
21	"	12	9,809	10.83	31s.	English machine-forged chequered Damascus, in four rods, improved economic compound coiling process.
31	5th	28	9,058	9.94	22s.	English steel, best quality, Siemens-Martin process, from pure Swedish iron, drilled in full length.
39	6th	27	8,591	9.43	24s.	English steel, Siemens-Martin process, rolled from hollow mould.
5	7th	1	8,548	9.05	35s.	English hand-forged best Damascus, in four rods.
7	"	10	8,248	9.05	27s.	English machine-forged best Damascus, in three rods, improved economic compound coiling process.
9	"	19	8,248	9.05	21s.	English machine-forged laminated steel, in two rods, improved economic compound coiling process.
11	"	15	8,248	9.05	29s.	English machine-forged chequered Damascus, in three rods, improved economic compound coiling process.
13	"	31	8,248	9.05	21s.	English steel, basic open hearth process, from hematite pig and scrap.
26	"	8	8,248	9.05	22s.	English machine-forged Boston Damascus, in four rods, improved economic compound coiling process.
17	"	17	8,248	9.05	18s.	English machine-forged Boston Damascus, in three rods, improved economic compound coiling process.
17	"	5	8,248	9.05	18s.	Foreign Damascus, in two rods.
28	"	21	8,248	9.05	14s.	English machine-forged iron Damascus, in two rods, improved economic compound coiling process.
30	"	22	8,248	9.05	13s.	English machine-forged iron Damascus, single rod.
31	"	4	8,248	9.05	20s.	Foreign Damascus, in three rods.
32	"	20	8,248	9.05	14s.	English machine-forged Boston Damascus, in two rods, improved economic compound coiling process.
22	8th	32	7,475	8.20	21s.	English steel, basic open hearth process, from hematite pig and scrap, carburised by Darby's filtration process.
23	"	33	7,475	8.20	24s.	English steel, basic open hearth process, from hematite pig and scrap, carburised by Darby's filtration process.
29	"	23	7,475	8.20	13s.	English machine-forged fine skep twist.
1	9th	18	6,738	7.40	22s.	English machine-forged laminated steel, in three rods, improved economic compound coiling process.
16	"	2	6,738	7.40	31s.	English hand-forged best Damascus, in three rods.
15	10th	24	6,702	7.36	12s.	English machine-forged skep twist.
25	"	37	6,702	7.36	30s.	Foreign Damascus, "Crollé," in three rods.
30	"	6	6,702	7.36	14s.	Foreign Boston Damascus, in two rods.
17	11th	29	5,965	6.55	24s.	English steel, Siemens-Martin process, rolled from a hollow mould.
18	12th	7	5,203	5.77	15s.	Foreign "Pointillé" twist.
25	13th	3	5,228	5.74	35s.	Foreign Damascus, "Crollé," in four rods.

and 1018grs. of shot. The *sixth* proof was 269grs. of powder and 1069grs. of shot. The *seventh* proof was 282grs. of powder and 1122grs. of shot. The *eighth* proof was 296grs. of powder and 1178grs. of shot. The *ninth* proof was 310grs. of powder and 1236grs. of shot. The *tenth* proof was 325grs. of powder and 1296grs. of shot. The *eleventh* proof was 341grs. of powder and 1361grs. of shot. The *twelfth* proof was 358grs. of powder and 1429grs. of shot.

"The barrels were proved throughout indiscriminately with the first proof charge, and if any one, on being viewed, exhibited a rejecting bulge, it was stamped R 1 (R standing for 'rejected'), and laid aside.

"The remainder, or all those which had stood the first proof, were then proved with second proof; again viewed, and those which had bulged were marked R 2—thereby showing that they had withstood the first proof but failed at the second; and so on, the figure connected with the letter R denoting the proof at which it had failed.

"This was termed the bulging proof, as indicating the condition at which a barrel would be rejected. When the whole of the barrels had exhibited this rejecting bulge, their order of merit of endurance was estimated as follows:

"The individuals of each of the thirty-nine specimens were collected and tied together, and the relative proof which each group had sustained was estimated by means of the following principle: Seeing that the proof charges are made up of a certain number of grains of powder, the explosion of which produces stress in the barrel, and of a certain number of grains of shot, the inertia of which increases that stress, it was resolved to add together the total grains of both powder and shot, as a measure of the comparative stress which each proof charge imposed.

"Each individual in a group was therefore credited as a figure of merit and endurance with the whole grains of powder and shot which it had borne, as indicated by the rejecting figure stamped upon it. The whole of the group was then so valued, by adding the proof of the individuals together, and dividing the sum by the number of individuals for the average figure of merit for the group of that kind. This system was followed throughout the thirty-nine kinds, and the table represents the order of merit of the whole of the kinds, with the average number of grains of proof which each kind sustained without any bulging, No. 1 being the highest in merit and No. 32 the lowest, some being equal.

FURTHER TESTS.

"The committee considered that it was then advisable to carry their experiments further by continuing the proof of all the indi-

viduals from the former stage with increasing charges, until every one either burst or exhibited a bulge of $\cdot 01$, or $\cdot 739$ of an inch.

"This enlargement was measured to 1,000th of an inch by an Allport's Patent Tube Measurer, adapted for the purpose. It was considered that any enlargements or bulge beyond $\cdot 01$ would permit the gas to get past the wad there, and so vitiate the proof. The same methods of mixing all the barrels, weighing the charges, loading, ramming, firing, washing, cleaning, and viewing, and one by one *rejecting* every individual barrel of the whole, was repeated in the presence of the committee until the trials came to an end.

"The figures of merit in this second series of experiments were attained in the same manner as formerly described, and the results are exhibited in the second table.

"It is worthy of remark that in the earlier stages of proof of the barrels shown in Table I., the first bulging of most of the barrels was at from 13 to 24 inches from the breech. The larger charges, later on, attacked the barrels generally 6 or 8 inches from the breech, and, in some of the kinds, after bulging 6 or 7 thousandths, remaining stationary for several proofs, eventually increasing until they attained the $\cdot 01$ inch, the rejection enlargement; while others showed little sign of expansion until they collapsed in the final proof.

"The committee are of opinion that this series of experiments has accurately presented the comparative elastic limit of the different kinds of material and influence of manufacture in the tubes. It is probable that the individual barrels in any group were made at the same time. The endurance of a barrel appears to depend upon a moderately high elastic limit (which prevents bulging), and a fair margin between the elastic limit and the breaking strain (which prevents bursting). If the composition of the metal and the method of manufacture are such as to yield a low elastic limit, the barrel is too soft, and bulges easily; while, if the elastic limit be unduly raised in proportion to the ultimate tenacity, the metal is deficient in ductility, and, being thus brittle, the barrel bursts. The most suitable condition appears to be attainable by judicious rolling or forging at a moderate heat, with as little reheating as is practicable. The elasticity and tenacity are affected by the purity of the metal, and by the mechanical structure set up in the compound figured irons by the various modes of twisting and laying them together. Some barrels of pure quality of material may have had their tenacity lessened by overtwisting or by mal-arrangement of structure, whilst others of more inferior material may have shown better endurance from a more judicious structure or treatment. The same remarks apply to the steels, which, under careful rolling at a moderate heat, acquire tenacity by the metal of the

barrel somewhat changing from a granular or crystalline to a fibrous nature, with also a greater density, and may explain the wide difference of endurance between barrels apparently made from the same material and under the same process.

"The committee are further of opinion, having regard to the dimensions of the tubes and the repeated and very great cumulative stresses which a large proportion of them have undergone, that the recent increase of stress by the proof charges in the New Rules of proof has not been greater than was justified in the interests of the public safety.

"The time and care bestowed on the work in order to arrive at just results involved twenty-two meetings of the committee. This did not include about sixteen other meetings for discussion. The whole extended over a period of two years, and it is hoped will be of value to the trade.

"Dec. 31, 1890.

"SAMUEL B. ALLPORT, Chairman.

"The Board, in presenting this report to the trade, have in view the justification of the new proof charges, and have gladly placed their resources at the disposal of the committee, and charged their revenue with the expenses of the trials, so as to create a confidence in them which could hardly have been derived from the experiments of private individuals. They have also wished to promote improvement in the manufacture of sporting barrels, and they trust the results exhibited, and the considerations above offered on the purity of the materials and structural manufacture of barrels, will receive careful consideration in order to further increase the reputation which Birmingham already possesses as the source of gun-barrel manufacture of the United Kingdom.

"SAMUEL B. ALLPORT.

"Chairman of the Guardians of the

"Birmingham Proof-House.

"Birmingham, Feb. 16, 1891."

NITRO AND BLACK EQUIVALENTS.

The loading of cartridges is generally left to the gun-maker or to the gamekeeper, but this paper would not be complete without some attempt being made to bring the instructions given out by the various powder-makers into something like comparative order. The makers try to issue instructions for equivalent loads of black powder, and this black powder is No. 4. For No. 6 black to

COMPARATIVE LOADS.

Shot.	Charges in grains of nitro powder recommended by the makers to go with various weights of shot, and equivalents in drams measure of black powder—1st in strength, 2nd by bulk.											Gauge of gun.
	Equiva- lent, by strength in black.	Schulze.	E.C. (No. 3)	Amberite	Normal.	Sporting Ballistite.	Can- nonite (No. 1).	Can- nonite (No. 2).	Kynoch's.	S.S.	Shot- gun Riflette	
Ozs. 3	Drams. 9	Grains.	Grains. 90	Grains.	Grains.	Grains. 83*	Grains.	Grains.	Grains.	Grains.	Grains.	4
3½	—	—	—	—	—	—	—	—	125	—	—	4
3	8½	119	—	—	—	—	—	—	—	—	—	4
2½	—	—	—	—	—	—	—	—	80	—	—	8
2	6	84	60	—	—	64*	—	—	—	—	—	8
2¼	6	—	—	80 = 5½†	—	—	—	—	—	—	—	8
1½	3½	—	40 to 44	—	—	32	—	—	49	44 = 8½†	44 = 2¼†	10
1½	3½	—	—	50 = 3½†	—	—	—	—	—	—	—	10
1½	—	—	—	—	—	—	—	—	55	—	—	10
1	—	—	—	—	—	24	—	—	—	—	—	12
1	2½	42	—	—	—	24	—	—	—	—	—	12
1	3¼	—	36	—	—	—	—	—	—	—	—	12
¾	—	—	29	—	—	—	—	—	—	—	—	12
1½	3	42	33	42 = 3 full†	—	26	35 = 1¾†	42	12 to 45	38 = 3†	37 = 2†	12
1½	—	45	—	—	—	28	—	—	—	—	—	12
1	2½	42	—	40 = 3 bare†	—	—	33	40	42	—	—	12
1, 1¼, or 1½	3	42	—	—	—	—	—	—	—	—	—	12
1½	3	42	—	—	32 to 34 = 2½†	—	—	—	—	—	—	12
1½	—	—	—	—	—	23	—	—	—	—	—	12
1½	3¼ to 3½	49	35 to 38	47 = 3¼†	—	29	40	46	16 to 49	41 = 3½†	—	12
1½	3½	—	40	—	—	31	—	—	45	—	—	12
1 or 1½	2½	40	—	—	—	—	—	—	—	—	—	14
1 or 1½	2½	—	32	—	—	—	—	—	40	—	—	14
1	2½	—	30	—	—	22	32	36	—	35 = 2¾†	32 = 1¾†	16
1	2½	37	—	36 = 2¼†	26 to 28 = 2½†	—	—	—	38	—	—	16
1½	3	—	—	—	—	—	—	—	42	—	—	16
¾	2½	—	—	33 = 2½ full†	22 to 24 = 1¾†	—	—	—	35	32 = 2¼†	—	20
¾	2½	32	26	—	—	20	30	32	35	—	29 = 1½†	20
¾ or 1	2½	32	—	—	—	—	—	—	—	—	—	20
¾	—	—	26	—	—	—	—	—	—	—	—	20
¾	2½	—	—	—	—	20	—	—	33	—	—	20
1	—	—	—	—	—	—	—	—	33	—	—	20
¾	—	—	22	28 = 2¼†	—	—	—	—	28	—	—	24
¾	1½	—	—	—	—	16	—	—	—	—	—	28
¾	1½ full	22	—	—	—	—	—	—	24	—	—	28
¾	1½	—	20	—	—	—	—	—	—	—	—	28

d-fowling Ballistite, 28½ grains equal one dram of black by measure. Ballistite and Cannonite No. 1 not t out loose, there is no need for giving their equivalent dram bulks in all cases. Sporting Ballistite, 29½ al one dram of black by measure.

ms in bulk of black powder. Thus 80 = 5½ means 80 grains of Amberite fills a 5½ dram measure.

become equivalent to the nitro loads given it would generally be correct to add as much as one-twelfth to the black charges stated; and for No. 2 black it would be equally proper to deduct one-sixth of the whole.

We have given in the following table, on the authority of the various makers, the equivalents of their powder to black powder. Some of the information has been given before with the instructions issued by each powder-maker in their separate sheets, but no attempt has been made to tabulate or bring together the whole of the information to be had from each manufacturer, who, by the nature of things, knows most about the powder he makes, and its relation to black powder. We have given the equivalents of strength on the authority of the makers, who are certainly best able to say what standard they are working up to; besides this, when the bulk of nitro differs from the bulk of black No. 4, on the same good authority we also state its equivalent in the dram measures used for black powders, thus: $29 = 1\frac{1}{2}$ in the columns for shot-gun Rifleite means 29 grains by weight of S.G. Rifleite equals in bulk $1\frac{1}{2}$ drams of black No. 4.

Now that powders are almost as numerous as London gunmakers, and now that bulk and condensed powders are in some cases only distinguished by a number instead of a name, it seemed to us necessary that someone should issue a table where all the powders in general use could be found in their relation to each other.

The makers of the powders named on preceding page issue advice peculiar to their powders, as follows:—

AMBERITE.—Cap: Medium preferred.

Wads over powder: "Field" card next powder, then $\frac{1}{8}$ -inch best felt, and a thin card over the felt.

Wad on shot: Thin card.

Wadding must be so proportioned as to leave $\frac{5}{16}$ inch for turnover. Powder should not be compressed much. In loading in "Ejector" and "Grouse" cases, use an extra grain of powder, and an 11 $\frac{3}{4}$ -bore "Field" card over the powder.

When loading with 40 grains of powder and 1 oz. shot, use a 7-16th-inch best felt wad instead of $\frac{3}{8}$ -inch wad.

The above loading will give the best results. But in loading with special charges always have not less than $\frac{1}{2}$ -inch of good quality wadding between the powder and the shot, and a turnover of 5-16th inch. Any additional wads introduced to fill up space, so as to get the requisite turnover, must be placed over the felt wad.

The powder should never be tightly compressed, but the wads just pressed firmly down.

SCHULTZE.—This company writes to us as follows:

Medium cap preferred.

Wads over powder: "Field" card, best felt, thin card.

Wads on shot: For close shooting, a thin card; for open patterns, a thick card or grey cloth.

Cartridges should be loaded exactly as black, and a fair turnover made: *i.e.*, enough to produce a firm and compact cartridge.

NORMAL.—Coned cases are advisable. For 12-bores the company recommend the "Field" cards, the felt $\frac{1}{4}$ -inch, the thick card. For 16 and 20-bores the grease-proof card, the felt $\frac{3}{8}$ -inch, the thick card over powder with a thin card over shot and moderate turnover.

E.C., No. 3.—About wadding, the company say special attention must be paid to the wads employed, but the following method is as a rule quite satisfactory:—(1) 3-32 card. (2) $\frac{3}{8}$ -inch best felt. (3) 3-32 or thin card. Thin card over shot.

It is not necessary or advantageous to compress the powder heavily in loading, the first wad should be only well seated.

The turnover should be regular.

BALLISTITE.—The company do not issue any special instructions except by insisting on a special case. We happen to know that soft wadding is almost essential with this powder. It is not issued loose.

CANNONITE.—We have received no instructions as to wadding with this powder. No. 1 is not sent out loose.

KYNOCH'S.—This powder can be loaded in ordinary cases with medium caps. They do not issue any instructions about wadding.

S.S.—The company recommend (1) medium card; (2) felt $\frac{3}{8}$ -inch; (3) medium card and the same medium card over shot.

RIFLEITE.—Made by the same company as S S, is loaded in the same way except that they use a thicker or thinner felt wad to correct turnover, so as always to leave $\frac{1}{4}$ inch of case for that operation.

Having now dealt with the loads, the cartridge case which to put them is of importance.



MR. JAMES IRVINE, one of the fathers of cartridge making.

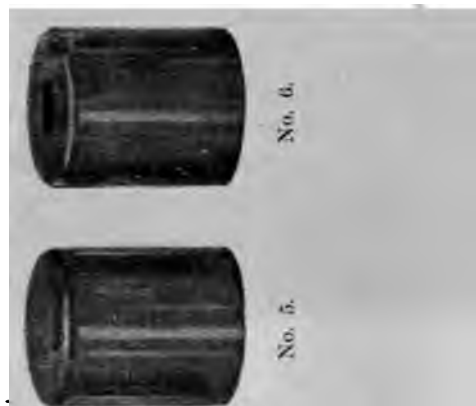
THE MANUFACTURE OF A CARTRIDGE CASE.

It is to Kynoch Limited that we owe a thorough insight into the making of a cartridge case. Simple as it may appear to roll a piece of paper into a tube and encase one end of it in metal with a hole in it, it is nothing of the kind in practice. Solid cold-drawn brass is in itself not a very old discovery, and we believe that it was one due to Mr. Rigby. Without it t

sporting cartridge as we know it to-day could not exist. But there is cold-drawn brass and cold-drawn brass, just as there is the cheap case and the expensive one. We can safely say that before we saw how Kynoch's made the head of a cartridge case we were not thoroughly aware how much difference there might be in two apparently identical cases. There is all the difference that exists between tempered steel, of which springs are made, representing in steel that which is correct in brass, and cast iron or lead, representing as they do the two tempers that have to be avoided in brass. What is wanted when we thoughtlessly put cartridges in our guns? It is obvious that the explosion will force the external portions of the brass into absolute contact with the internal surface of the gun chamber. Now, if the metal was soft, like lead, it would stick there, and then the best ejector in the world, assisted by Spratt's patent extractor knife, would not get it out again. What is wanted, therefore, is that the metal should expand and spring back to its original gauge or very near to that. It is all very well to say, "Of course, then use metal that will do so." But the same metal is capable of doing it or not doing it; it is also capable of being made so hard that it will split up, and the same may be said of the paper tube. The secret of a good piece of metal is that it should be handled a great number of times. Thus if we take the base of a cartridge case of the half length, or the perfectly gastight sort, it is capable of being punched out of a flat piece of metal all at one go. But then it is in such a hard condition that it will probably split when fired. It can be softened by heat, but if the fire is used then there is more difficulty, for the fire converts it into a soft, stretchable, non-elastic substance, that certainly will not split, but will form a perfect mould of the chamber of the gun, so perfect that it will stick tight. It is obvious, therefore, that in order to accomplish the right temper of the brass it must be gently treated. It must be built up by stages; the flat metal is punched and produces a shallow cup, which,



THE PAPER TUBE TO BE CUT INTO THREE.



No. 1.

No. 2.

No. 3.

No. 4.

No. 5.

No. 6.



after it has been annealed, is soft as a bit of wet paper, ready to remain in any shape the finger may press it to. This shallow cup is No. 1 in the diagram. The second stage is succeeded by a similar process exactly, except that a more elongated and narrower cup is the outcome; this is No. 2. This, after being heated, is punched into No. 3; this again into No. 4, and this is left with the remaining hardness in it, and does not go again into the fire. The next stage is to cut the brass to the proper



No. 10.



No. 11.



No. 12.

length, as in No. 5, and the following is to bore the hole for the cap chamber, as in No. 6. Thus we have seven different operations, besides the three firings, to convert the solid sheet of brass into cup No. 6. Now exactly the same piece of metal can be converted into precisely similar shape at once, and for the cheapest cartridges it is necessary that it should be done in that way; but for the best quality, with all the necessary spring in them, the above is the process. It must be remembered that machinery has not yet arrived at the

stage of passing on from one machine to another, and every new operation involves handling every piece of cartridge case separately for each machine. The extraordinary quickness with which the girls employed at this work do it is something wonderful. Their living depends upon their speed, for our Free Trade notions demand that they should work against the foreigner for price. First-rate machinery, it goes without saying, is absolutely necessary to the condition, and highly trained cheap labour is no less important.

When we were over Kynoch's works in the spring of 1898, a new cartridge tube-making machine was being tried. This automatic rolling machine we now hear is to be merely preliminary to a total change of work. It may be well, therefore, to describe how it works, as it is the latest advance in cartridge making. A girl sits on one side of it and puts in sheets of paper as fast as she can separate them, while on the other side these sheets drop out as paper tubes ready for cutting up into cartridge lengths. The machine, therefore, has performed two operations; it has pasted the paper with beautiful smoothness and it has rolled it into tubes all automatically. In fact, it spits tubes as fast as it can be fed with paper.

There is one machine in which as it goes round, treadmill fashion, a cartridge case has to be placed upright with the brass downwards on every one of many spaces. The machine won't wait, and consequently the cases have to be placed in double quick time, several hundred in a minute, we guessed it. At first glance we thought we might do it, but on looking into the tub of cases to be operated upon we discovered them to be in no order whatever—heads and ends all mixed in absolute confusion, and yet the woman working this machine has the wonderful knack of diving her two hands in amongst the confused mass and producing therefrom, without any apparent sorting, a double handful of cases, *each with the brass downwards*. We resolved upon the spot never to enter into rivalry with an old-established cartridge factory. What difficulties there are to overcome

the perfection of the working at Witton discloses, and as we look we are no longer surprised that the founder of this business, the late Mr. George Kynoch, discovered it to be too much for him, and very nearly came to grief over it. In fact, it is generally believed that if Mr. Arthur Chamberlain had not come to the rescue with his business capacity just when he did the whole industry would have disappeared from Birmingham.

It is obvious that it is of no use having an elastic brass unless the paper case is also elastic. When wet takes out the elastic nature of the paper we get sticking cases, and the quality of the paper may be naturally that of blotting paper, or it may be elastic. Everything is done to render it the latter. We are told that air drying is essential for this, and then the paste has to be particularly well made from the most suitable wheat flour. The paper, cut into sheets about 14 inches long, is placed in packets before girls, who hand-brush each sheet with the paste and place it on a rod; the latter is revolved by machinery so quickly that the tube appears to be perfectly formed almost as soon as the paper touches the rod. That is to say, this is for the "whole paper" cases. We mean those which are made throughout of one sheet of paper; but here is a tube brown inside and deep orange outside, bearing the name of Nicholson and Sons, Whitby, in three places, and the brand of "St. Hilda cartridge." That means a second roll of paper over the brown, with all the printing and the colour upon it just as the cartridge will bear when it is loaded. "Do you load those cartridges, too?" we ask, for we think that if so the fancy naming does not mean much. "No, not those," we are told, and yet we know as a matter of fact, without gathering our information from Kynoch, that the obliteration of the majority of fancy names would leave precisely the same factory-loaded cartridges in almost all the gun shops.

We have it on the best possible information that all fancy names cost a good deal more money than the shooter should be charged with. It is for this reason. If a gunmaker orders, say, 10,000 cases of special printing with his name and trade mark he can have them, but the maker cannot

make precisely 10,000 brass heads and 10,000 paper tubes of a special name. Therefore there are usually more heads than tubes or tubes than heads. "What do you do with these, then?" we asked. "Oh, we burn the paper and melt up the metal again," was the reply.

One of these days we hope there will be some sort of uniformity such as the powder-makers are trying to initiate. Every powder should have its own coloured case, and then if there was anything wrong the fault would lie between the powder-maker and the case- and cap-maker. Now a condensed powder, bulk for bulk, may find its way into a bulk powder case which will hold a great deal more than it is safe to put in, and in fact there are few gunmakers who can guarantee the cases and caps they issue being the best adapted for the various powders they put into them.

This naming of makers of cartridges on the tubes works very badly. In fact, it is an absolute guarantee that a gunmaker will not use a special case and cap for each powder. The way it works is this. The gunmaker must order his cases early in the season, long before he gets an order for a single loaded cartridge for the coming season. It is obvious that he will have to take the risk of selling them, and he is quite in the dark as to what powder will be asked for in them. No doubt some of the condensed powders he must order specially for; but the bulk powders he lumps together; they may be waterproof ones or porous, it is all the same. He cannot split up his orders and have a thousand of each of several sorts. If he did, and then one or more of the powders did not create a demand that year he would be left with a few thousand unsaleable cases on his hands. Suppose, on the other hand, that he ordered 10,000 cases with no name on them, but with the brand of the powder upon each of them, it would in case of an over-supply of one powder case be only a question of exchange with the makers for others.

It is this demand for uniformity of case by the country gunmakers that is killing their trade. It is not only killing their trade, it is setting up a stupid demand for uniformity of cap, or ignition, for powders that are not uniform in

manufacture and never can be. Indeed, this printing business is putting a check on progress.

A powder-maker has, in consequence, to work to a certain type of detonator which he may know, and does know, to be bad. He has to do so, because if he were to insist on a separate cap he would put all the cases ordered by the gunmakers out of use for his powder. That would mean a nail in his own coffin. He therefore prefers uniformity or partial suitability for all, coupled as it must be with mediocrity or the absence of thorough suitability for either.

That we have not arrived at finality is certain, but progress must be very slow as long as the country gunmaker insists on his own labels. That we had not arrived at the utmost possible ballistic power we had some indication of when we tried Van Forster powder. We discovered that with less than half the internal chamber strain it gave as high velocities as any powder. Again the gunmaker and his demand for uniformity stood in the way of the shooter and his desire for great velocities and small internal strain. The powder would not load well with the ordinary machine, consequently the gunmaker would not load it at all. This may have been right in the individual case; but it is the principle we object to. In this case new loading machines were possibly necessary, and the gunmakers' demand for uniformity prevented the shooter from obtaining results in a certain direction which rightly or wrongly he demanded. The same demand of uniformity prevents us getting the most out of each of the various powders, and makes us pay very much higher for a worse article, all because the majority of gunmakers demand the advertisement of their own names upon every cartridge sent out, whether they happen to have loaded them or not. As most of them do not load themselves, what they really advertise by this means is an untruth.

Having made this tube, the next business is to dry it. This takes four days, and when this is accomplished the tube is by no means the perfect-looking thing it was when it came off the roller. Blisters and warping are its principal features, and the beautiful gloss that gunmakers demand on their

cartridge cases is conspicuously absent. From the drying-shed it goes into the polishing machine. This is really a machine of many qualities. Pressure and friction being its attributes, it takes every blister out by pressure and leaves the beautiful polish we are all acquainted with.



MR. ROBERT FRYER, on whom we depend for a Kynoch Cartridge Case.

Besides the cap and cap chamber, which both, of course, are separately made and done upon similar lines to the brass head of the cartridge case, there is the caulk or pellet, and this is made out of brown paper sheets very much the same as a cartridge case is made. That is to say, it is rolled into tubes of about nine inches long, and, when dry, these are

cut into sections, of which Fig. 8 is an illustration. The next business is to press this into the required shape; this pressure reduces No. 8 to less than half its size, viz., to No. 9, where the brown paper has become by pressure as hard as wood. This caulk is as important to the cartridge as the halfpennyworth of tar is to the boat. It holds it together. Collecting the pieces is entirely hand work, done by girls in the quickest of time. No. 10 shows the result of the first collection; that is, of the inside lining, the caulk which is forced into this from the front, and the cap chamber which without its flash-hole is forced in from the rear. No. 11 shows the same case in the next stage with all these bound together by means of machine pressure; this produces the rim in the half-finished stage in which it is seen in Fig. 11. No. 12 shows another stage, in which the rim of the grouse ejector case has been perfected by further machine pressure. The whole of the pieces being bound together by the formation of the permanent shape of the brass base of the cartridge case, it will be obvious that in order to get them apart in a whole condition it would be necessary to force this rim back to its original symmetry with the rest of the base. It follows, of course, that in a best English case, as made by Kynoch, the cartridge cannot come to pieces without breaking.

This finishing off with the pieces inside is the whole secret of strength; it is almost equal to the formation of the bottle-shaped neck of the small bore rifle cartridges after the insertion of the powder, and after the powder wad has been seated.

The last operation after cutting the flash-hole in the cap chamber is the insertion of the anvil in the cap and the cap into the cap chamber. This is done with a wooden hammer, and the cap receives a good bang with this instrument. The effect is to fix it in the case without bringing it in contact with the anvil.

It is somewhat difficult to make a selection of trials of powders. The use of them is only temporary, as the batches of powders constantly change, and we therefore exclude from our present scheme all those trials that have not some

permanent value, such as the value of proper length of case or the proportion of shot to powder.

TRIALS OF POWDERS.

Normal powder for the shot-gun is only about three years old in this country, although its namesake, rifle powder, is considerably older. Its introduction is due to Mr. G. Roos,



CAPTAIN GARNETT.

who is Managing Director of the Company, and who was, for many years, with Nordenfeldt. Associated with him at that time was Capt. Garnett, and it was natural, therefore, to find the latter in the position of examiner of the cartridge loading business that has done so much in so short a time. The Normal powder is of Swedish manufacture, and it was introduced over here just at a time when gunmakers were pestered by a multitude of new powders. There is a good deal to be done before a gunmaker will feel bound to make

himself acquainted with all the characteristics of a new powder. First, there was at that time a great difficulty about storage. The law only allowed a certain small quantity of gunpowder to be stored, and the more sorts a gunmaker had in stock the less of any one kind he could have. The Normal Powder proprietors were, therefore, met by the hard fact that the gunmakers, as a rule, could not store their powder, but only order it as and when their customers demanded.



MR. ROOS.

Although, perhaps, it was not intended as such, this was, as a matter of fact, a direct challenge to the Company to go direct to the customer and get up a demand for the powder. That is what the management thought, at any rate, and they are, naturally, somewhat surprised that, having accepted the invitation of the gunmakers, they should be regarded as having gone behind their backs in the matter.

No doubt the introduction of a new powder is a difficult business. What gunmakers have said to us is this : " Show

us something not merely as good, but having some totally different and better characteristics, and we will be fast enough to change." As a matter of fact, that is what the Normal Powder Company did show. As against the old, well-known powders, they said: "Our powder is not only waterproof in the sense of not being porous as the old powders are porous, but it is also damp proof." There were, at that time, only a few non-porous powders on the market. The principal of these were Cannonite and Ballistite, neither of which, at that time, had assumed proportions of rivalry with Schultze and E.C. The Normal Powder Company are nothing but cartridge makers; they are not powder makers, nor cartridge-case makers. No other such company exists unconnected either with gunmaking or cartridge-case making, and in their efforts to do as they were told—to get the patronage of the shooters themselves—they have inaugurated several altogether novel features. One of these is that they throw open their targets and shooting grounds to their shareholders, in order that, at no expense to themselves, they can run down to Cricklewood and determine for themselves which powders and cartridges suit them the best. Many first-rate sportsmen are, we know, content to do what their gunmakers and their own observation in the field tell them to do, without any regard to target experiments or crusher gauge tests. Probably they are generally right, but distinctly not always. We venture to say that gunmakers do not pay the same attention to cartridge loading that powder-makers' experts pay to it. They have something else to do; something that they take a greater pride in doing, and with justice, for a good gun is, after all, a consummate work of art. Yet the necessity for the utmost care in loading cartridges is of equal importance, and the risks that are run by badly-loaded cases, or by the collection of components unsuitable to one another, is brought home to us almost every time we have occasion to go to the plates for experimental purposes.

As an example, we will give the record of what we did at our visit to the Normal Powder Company's works.

We had then already reported upon results obtained from

both varieties of Ballistite powder cases (short and long), but the former were tried prior to our condemnation of Mr. Lancaster's Pigmy Walsrode cartridges, and as we did not compare the results given in the ordinary length and short length cases at that time, it may be of interest to do that now, especially as an attempt has been made to prove that the short cases are as good in an ordinary chambered gun as the long ones. It has also been affirmed that these short Ballistite cartridges do not ball their shot from any $2\frac{1}{2}$ -inch chambered gun. That is confirmatory of our early experience of them, and of that from a different gun since. But, after our experience of Lancaster's Pigmies and their balling, before we could trust any short cartridge in any particular gun, we should want to see at least 500 shots with it fired at the p'ate, for our experience is that caps, even of the best makes, vary considerably, and that a change of caps can generally bring about balling from short cartridges in long chambers.

The only probable way to avoid balling under these circumstances seems to us to be to use a cap of powerful energy, but with low igniting force—that is, low heat. By this means the powder wadding can be moved past the cone of the chamber before most of the powder is ignited, but then, although there will be no balling, there will be very little penetration. With 2-inch chambers, there is no reason why the short cartridges should not answer perfectly; but with long ones our experience is that if there is not dangerous balling of the shot from short cases, there will certainly be much loss of velocity and penetration.

Velocity here was observed at ten yards, and at muzzle, so that it is mean velocity over ten yards that is recorded, and not muzzle velocity. Penetration was taken by what we consider the best of all tests—20-sheet Pettitt penetration pads, and the decimals represent the proportion of pellets that passed right through the pad. It will be seen that the penetration and velocity records generally confirm one another as to direction, and, more or less, as to degree. When we remember that stringing of the shot varies according to powder and according to suitability of load, it cannot

be expected that the two methods of test should have no separate story to tell when penetration is taken at 40 yards and velocity is observed at ten yards.

TRIALS made by us April 19, 1898. $1\frac{1}{8}$ oz. No. 6 Shot in all cases, and regulation load of powder as laid down by the respective companies.

Right Barrel.	Pattern, 30-in. Circle.	Outside Pawl.	Pellets on Pawl.	Pellets through 20-sheet Pawls.	Velocity in Foot Seconds.	Proportion of Shot through Pawl.
Normal powder	187	157	30	22	1,100	
	214	170	44	34	1,087	
	205	164	41	22	1,047	
Average	202	—	38	26	1,068	.66
Ballistite, $2\frac{1}{2}$ in. cases	183	159	24	6	1,034	
	180	156	24	11	1,043	
	223	196	27	12	1,104	
Average	195	—	25	9	1,060	.36
Ballistite, short cases	169	143	26	6	860	
	157	127	30	10	921	
	180	142	38	15	1,050	
Average	168	—	31	10	943	.32

The following internal pressures were taken at the same time with Eley's ordinary lead crusher gauges and their readings : -

TONS PER SQUARE INCH.

Pressures per square inch of	First Plug at 1 in. from Breech.	Second Plug at $2\frac{1}{2}$ in. from Breech.
Normal 31 grains, $1\frac{1}{8}$ oz. No. 6, as tested in the above trials	2.719	2.687
	2.719	2.813
	2.656	2.781
Ballistite, long case, as supplied by the firm, and tested in the above trials	2.394	2.394
	2.072	2.000
	2.394	2.464

A novel feature of the method of business of the Normal Powder Company, is what they term its co-operative principle-- that is to say, they give a reduction to their shareholders, and besides this, they have published a book containing 100 opinions of their powder. Cheapness has always been a great feature of their business, and it has been left in the hands of Captain F. H. Garnett (late 15th Regiment), who retired from service in 1874, to see that cheapness is combined with quality. We can honestly say that we do not believe a more practical man could have been selected. He knows all about shooting in the field, and he has, besides, a knowledge of the scientific instruments necessary to insure "that blessed word" --uniformity.

E.C. No. 3 and Mr. Borland's loads have of late received a good deal of attention from sportsmen. It will have been noticeable that E.C. powder had almost dropped out of use at the weekly competitions at Hurlingham and the Gun Club, but that the moment a fair sprinkling of general shooters come together, as they do during the International week, a large number of shooters stick to E.C. powder, which they have learnt to use at game, and do not give up at pigeons, in spite of the large additions to prizes offered by rival makers to those who use the particular manufacture of those who provide the prizes.

We have usually indulged in an analysis of the shooting during the International week, but the special inducements offered by some makers of powders to get their powder used seem to us to negative the value of any analysis. It is, in fact, no test of gunmaking, and no test of powders either, when there are wheels within wheels, and some hidden strings are pulling the ropes unknown to the looker-on or to the reader of the records. We do not think anyone has cause to object--certainly not the shooters--if the prizes are given openly: the worst that can be said of the shooters under such circumstances is that they convert themselves into makers' amateurs, and shoot for a maker's advertisement. This may dispose some men to give up the use of their favourite powder for two different reasons. There is the man who gives it up in order to secure a chance for the bigger prize.

and there is also (and all honour to him) the man who gives up his favourite powder and shoots with another, in order that he may avoid being thought for a moment to be shooting for a powder maker. We are particularly gratified to see how well E.C. powder has held its own during the International week, and also at the Continental Dove Tournaments, because we have not heard the slightest rumours of pigeon shooting prize subsidy in connection with the E.C. Company or powder. We know that it has shot its way to the front upon its own merits alone, and this pleases us for another reason. When it first came out in 1897 we tried it in 12-bore guns, and found it highly satisfactory. Three points in particular came out wonderfully well in our tests of it. They were these: It heated the barrels much less than the old E.C.; it gave no blow back; and it gave much less smoke. Of course it is possible to load any nitro-powder badly, and the wisdom therefore of Mr. Borland's policy in publishing tables of proper loads is obvious. We were invited to make an exhaustive trial of cartridges, and publish, if we desired, the internal barrel pressures, the velocities of the shot at ten yards, and the penetration at our own 20-sheet swinging penetration pads at forty yards. We accordingly made these trials, omitting measure records of recoil, because we agree with Mr. Borland that recoil has never yet been satisfactorily translated either into pounds or foot-pounds, and that there is no real test for it but the feelings of the shooter. Pattern we have not counted either, because it is all a question of the gun, and it would be entirely misleading to say that any one load would give better pattern than another in every gun because it happened to be the best in the gun we were using. Perhaps the same argument, to a much less degree, applies against velocity and penetration. We at once admit that there is nothing absolute when any one out of 300 pellets may alter a record. Thus we very seldom find that the velocity record at ten yards from the muzzle and penetration at forty yards agree with each other, even when both are taken at the same discharge:

but Mr. Borland goes further than this, and declares that velocity at ten yards seldom rises or falls along with the velocity registered at greater distances.

It is now generally accepted that the slow-igniting powders—that is, the nitro-powders—give better patterns than the quick powders—that is, the various grains and brands of black powder. But as pattern is almost entirely within the control of a good gunmaker, it seems to be a loss of energy to describe what one gun alone will do as if it had any relation whatever to what others would do.

Recoil is an important question in gunnery, and it has hitherto defeated science. The mistake made by experts has been to attempt to measure the total energy of the backward movement of the gun; but if this truly represents recoil, it certainly does not accurately measure kick. The difference between a long sustained push and a blow is the difference that may be found in various differing recoils, although they may all give the same total amount of energy measured in foot-pounds. No. 4 black powder has given us particular notice to quit from an 8-bore, and whatever may be the energy of recoil in foot-pounds as between a load of it and an equivalent (velocity) load of the new E.C., there is no comparison to the feelings of the shooter. The latter is no more unpleasant than the firing of a 12-bore, whereas No. 4 black is not a pleasant charge to fire with. We selected No. 4 because it has become (thanks to Mr. Greener) the standard of comparison for nitro-powder.

In the following table we have not given the pressures at more than one place in the barrel—that is, at 1 in. from the breech—although we took them at the $2\frac{1}{2}$ in. distance in several instances in order to see whether there was any reason for the double record. Generally the pressure at 1 in. was the higher, and for this reason we have not thought well to weight the records with unnecessary figures.

In some cases, where there was nothing to be gained by giving the results of individual shots, we have omitted them and given the average of the shots fired instead. Where, however, we are able to take pressures, velocities,

RESULTS OBTAINED ON JUNE 27 AND JULY 4, 1898, WITH E.C. No. 3 POWDER, AS COMPARED IN SOME INSTANCES WITH No 4 BLACK POWDER.

Wadding.	Bore.	Powder in Grains Weight.	No. 6 Shot in ozs.	Pressure in Tons per sq. inch at 1 inch from Breech.	Velocity taken at 10 yards in f. s.	Penetration or Proportion of Shots through 20 sheets.
Field cloth two $\frac{5}{16}$ felt and card. Card over shot	4	90 E.C. (No. 3)	3	$\left. \begin{array}{l} 1.95 \\ 2.46 \\ 3.15 \\ 2.00 \end{array} \right\} 2.39$	$\left. \begin{array}{l} 1,171 \\ 1,167 \\ 1,151 \\ 1,151 \end{array} \right\} 1,160$	
Ditto - - -	4	225 (No. 4 black)	3	3.15	1,094	
$\frac{3}{32}$ in., $\frac{5}{16}$ in. felt, and card; card over shot	8	60 E.C. (No. 3)	2	$\left. \begin{array}{l} 3.71 \\ 3.24 \\ 3.16 \end{array} \right\} 3.37$	1,271	.74
Ditto - - -	8	150 (No. 4 black)	2	$\left. \begin{array}{l} 3.74 \\ 4.04 \end{array} \right\} 3.89$	1,274	.69
$\frac{3}{32}$ in. card, $\frac{3}{8}$ in. felt, $\frac{3}{32}$ in. card; thin card over shot	12	33 E.C. (No. 3)	$1\frac{1}{8}$	$\left. \begin{array}{l} 2.14 \\ 2.14 \\ 2.32 \end{array} \right\} 2.20$	$\left. \begin{array}{l} 1,110 \\ 1,144 \\ 1,144 \end{array} \right\} 1,132$	$\left. \begin{array}{l} .66 \\ .73 \\ .55 \end{array} \right\} .64$
Ditto - - -	12	3 drs. black No. 4	$1\frac{1}{8}$	$\left. \begin{array}{l} 2.14 \\ 2.75 \\ 2.59 \end{array} \right\} 2.48$	$\left. \begin{array}{l} 1,087 \\ 1,100 \\ 1,130 \end{array} \right\} 1,105$	$\left. \begin{array}{l} .59 \\ .75 \\ .47 \end{array} \right\} .60$
$\frac{3}{32}$ in. $\frac{1}{2}$ in. felt, $\frac{3}{32}$ in. over shot	12	29 E.C. (No. 3)	$\frac{7}{8}$	$\left. \begin{array}{l} 1.87 \\ 1.87 \\ 1.75 \end{array} \right\} 1.83$	$\left. \begin{array}{l} 1,076 \\ 1,076 \\ 1,076 \end{array} \right\} 1,076$	
$\frac{3}{32}$ in card, $\frac{3}{8}$ in. felt, $\frac{3}{32}$ in. card; thin card over shot	12	36 E.C. (No. 3)	1	$\left. \begin{array}{l} 2.81 \\ 2.10 \\ 2.91 \end{array} \right\} 2.60$	$\left. \begin{array}{l} 1,213 \\ 1,210 \\ 1,210 \end{array} \right\} 1,211$	$\left. \begin{array}{l} .83 \\ .69 \\ .92 \end{array} \right\} .81$
Ditto in $2\frac{3}{4}$ in. cases	12	38	$1\frac{3}{16}$	$\left. \begin{array}{l} 3.70 \\ 3.85 \\ 3.57 \end{array} \right\} 3.70$	$\left. \begin{array}{l} 1,190 \\ 1,195 \\ 1,210 \\ 1,194 \end{array} \right\} 1,198$	$\left. \begin{array}{l} .70 \\ .90 \\ .80 \\ .60 \end{array} \right\} .75$
Cloth $\frac{3}{8}$ in. felt. Thin card. Thin card over shot.	16	30	1	$\left. \begin{array}{l} 2.60 \\ 2.80 \\ 2.90 \\ 2.49 \end{array} \right\} 2.69$	$\left. \begin{array}{l} 1,110 \\ 1,110 \\ 1,101 \\ 1,100 \end{array} \right\} 1,007$	$\left. \begin{array}{l} .66 \\ .68 \\ .41 \end{array} \right\} .58$
Ditto - - -	20	26	$\frac{3}{4}$	$\left. \begin{array}{l} 2.68 \\ 3.25 \\ 2.80 \end{array} \right\} 2.91$	$\left. \begin{array}{l} 1,165 \\ 1,157 \\ 1,182 \end{array} \right\} 1,168$	$\left. \begin{array}{l} .89 \\ .77 \\ .65 \end{array} \right\} .77$

and penetration all from one discharge, we have given the results of each shot in order to show that the highest pressures do not necessarily mean the highest velocities, and that the latter registered at 10 yards do not always correspond with penetration at 40 yards distance.

We rely very much upon penetration at the 20-sheet pads we use, and, as before explained, we adopt the system of taking the proportion in decimals of shots that pass through the pad as the average penetration of the shot charge. This is a great saving of time, and moreover it is not misleading, as is the method of counting the furthest sheet pierced by the leading three pellets.

We must congratulate Mr. Borland and the E.C. Company on these results, and we would particularly call attention to the splendid velocity and penetration obtained from 36 grains of No. 3 powder and 1 oz. of No. 6 shot. This is a regular game charge, its beauty consisting not only in the energy of the load, but in the absence of jump, so that the shooter is able to get in his second barrel so much quicker than he can with a heavy charge of kicking powder.

The pigeon load also gave excellent results in $2\frac{3}{4}$ its cases, and velocity and penetration were very little under that of the loading above referred to, whereas of course, the addition of $\frac{3}{16}$ oz. of shot to only an increase of 2 grains of powder led us to expect a greater falling off, for this is increasing the driving power by only $\frac{1}{16}$ th, and giving more work for it to do by $\frac{3}{16}$ ths. It is, speaking roughly, adding four times as much shot as powder to the former charge. Resistance, as is well known, is an important factor in the development of the power of all slow igniting powders such as nitro-powders, but it was not generally believed that resistance by the addition of mere weight of shot could so nearly equalise velocities and penetration as is shown here. We selected $1\frac{3}{16}$ of an oz. of No. 6 in preference to the limit pigeon charge of $1\frac{1}{4}$ oz., because it is very much adopted now at the two principal gun clubs, and is recommended by the most successful gunmakers for pigeon match shooting.

In reference to the big bores, it has been amongst sportsmen a sort of hereditary belief, dating from the early days of gun-cotton, that the nitro-powders gave too much pressure for safety in 8 and 4 bores. This is not so; indeed, the bigger the bore the lower is the pressure of E.C. as compared with black powders. They are much nearer together in the small bores than in the larger ones. Of course, No. 6 or larger grain black powder than No. 4 would bring them nearer together in the large bores, but this would be at the expense of velocity of the shot from the black powder. The object of the comparisons would have been lost had more large grain black powder been used to supply the place of loss of power consequent on the larger grain, for the No. 3 E.C. is supposed to be bulk for bulk equal to black powder although the black dram measure only contains, by weight, 11 grains of No. 3 E.C.

For the difference in heating of the barrels, in blow back, and in smoke, in favour of the new E.C., we must refer readers to earlier chapters.

From time to time we have had to make use in these pages of various distances for recording velocities, and we have therefore asked permission of Mr. G. G. André, who is well known as the inventor of Amberite powder, to use his table for converting velocity at one distance with velocity at another in order that the conversion may be readily made when necessary, and in order, also, that his clever work may be permanently preserved.

Mr. André describes his method as follows :—

VELOCITY OF SHOT.

“ Bashforth's tables enable us, as all know, to ascertain readily the muzzle velocity of a rifle bullet from the mean velocity recorded by the chronograph over a given range of, say, 60 yards from the gun. But for shot guns these tables do not apply, and it is generally believed that for such projectiles as a charge of small shot no fixed relation exists between the muzzle velocity and the mean velocity over a given distance. Within limits this is true. It is not possible to bring any individual shot under a general law such as that on which the tables for rifle bullets are founded, for a charge of small shot, which leaves

the gun in cylindrical form, breaks up irregularly from various causes. Sometimes it begins to break up and to scatter as soon as it is clear of



MR. G. G. ANDRÉ, Inventor of Amberite Powder.

the gun; sometimes the mass is projected a considerable distance before the scattering action begins to take a marked effect. In the latter case the velocity is better maintained than in the former; but

when we take a mean of not fewer than five shots, we find that these irregularities correct one another, so that this mean shows a definite fixed relation among the velocities over different distances. That is to say, if we know the velocity over a range of, say, 10 yards, we can calculate with accuracy the muzzle velocity, and the velocity over another range, of 20 mètres, for example. This being so, we can calculate and form a table from which, when we have learned the velocity by actual measurement over one range, we can by inspection ascertain the velocities over other ranges, and at the muzzle of the gun. Such a table I give hereafter. Its uses are obvious, and they are of considerable practical importance. The velocities obtained from this table may not, for the reason already given, be exactly correct for each individual shot. But if all is as it should be, that is, provided there be no fault in the caps, the cases, the wadding, or the powder, they will not be far wrong, while the mean of not less than five shots will agree with the figures in the table within limits of variation so narrow as to be of no practical importance. Thus the table shows what the velocities of each individual shot should be. Here lies one of the most important uses of the table. For if we take the actual readings of the Jervis Smith chronograph over all the ranges and compare them with the figures in the table, we detect at once any irregularity or defect in the shooting that would not be otherwise discovered.

"In my investigations into the subject of relative velocities over certain given distances my first experiments had for their object the direct measurement of the muzzle velocity. The testing ranges of the Messrs. Curtis and Harvey are exceptionally well provided with measuring instruments of precision, there being, among other instruments of that class, no fewer than six chronographs, of which two are Jervis Smith's, made by Elliott Bros., with all the latest improvements. Having these at my disposal, my task was not a very difficult one. Time and care only were required to obtain accurate results.

"Measurements of velocity were first taken over the 6in. between two electrical circuits, one of which was placed 1in. behind the muzzle and the other 5in. beyond the muzzle. A sufficient number of shots having been fired to give a reliable mean value, the first circuit was shifted forward 1in. to the muzzle and the second brought back 1in., giving a distance of 4in. beyond the muzzle over which the velocity was next to be measured. The average of the records over these two distances being practically equal, this latter distance was finally adopted for direct muzzle velocity measurements. Curtis and Harvey's Diamond No. 4 powder was used in the whole series of these experiments, the shot being No. 6 chilled,

of 270 pellets to the ounce. The charges were 3 drs. (82 grs.) and $1\frac{1}{2}$ oz.

"The muzzle velocity having been in this way determined, the electrical circuits were set 1ft. apart—that is, at the muzzle, at 1ft., at 2ft., and at 3ft. from the muzzle, and records taken of the same shot. The distances were gradually increased till the range of 10ft. was covered, chronographic records of ten shots being taken for every change of distance. These experiments were exceedingly interesting, because chronographic measurements showed, in some degree at least, what happens to a charge of shot immediately after it leaves the gun. Up to about 4ft. 6in. from the muzzle the velocity continues to increase, though at a slow and, of course, a diminishing rate. Over the next $2\frac{1}{2}$ ft., or thereabouts, the velocity is practically constant. Beyond a point about 7ft. distant from the muzzle the velocity begins to decrease, and that rapidly, the falling off over the interval between the 7ft. and the 10ft. ranges being considerable. In speaking of these distances I have said there or thereabout, because there are slight variations in the behaviour of individual shots, due probably to the charge of shot breaking up more or less quickly.

"It is not, I think, difficult to account for this behaviour of the projected shot charge. When the shot has issued from the muzzle the resistance due to friction in the barrel ceases, while the gas pressure upon the moving mass of shot, though greatly reduced and rapidly diminishing, is maintained for a time. Moreover, the powder gases, having a velocity greater than that of the shot, get in front of the latter, driving the air before them, so that for a time there is no atmospheric resistance to overcome; therefore the velocity increases. Then follows a time during which the impelling force and the atmospheric resistance which is beginning to come into operation are practically equal, and the velocity is consequently constant over that period of time.

"Among the discoveries made in these experiments is the fact, which is of considerable practical importance, that the chronographic records of velocity over the whole distance of 10ft. from the muzzle of the gun are, for all practical purposes, the same as those for the first 4in. from the muzzle. Knowledge of this fact greatly simplifies the taking of muzzle velocities by direct measurement, for a chronographic measurement over a range of 10ft. is much more easily taken than one over 4in.

"The next set of experiments were intended to throw some light on the rate of loss of velocity over sporting ranges. With this view the electrical circuits or 'screens' were set up—(1) at the muzzle of the gun, (2) at 10ft., (3) at 10 yards, and (4) at 20 mètres from the muzzle.

To obtain reliable results Black powder, Curtis and Harvey's Diamond No. 4, was used, and the cartridges were loaded with great care, to get uniformity as far as possible. Further, arrangements were made to eliminate the influence of wind on the shot. It is worthy of mention, too, that the Boulengé chronograph was, in this series of experiments, used in conjunction with the Smith, to check the readings of the latter. It will be easily understood that when two sets of wires are used on one screen the two instruments, however well adjusted, will not, or at least may not, give the same record, because the wires of both instruments are not broken by the same pellet. This difficulty was got over by using fine silk-covered wire for the screens, and twisting the wires of the different circuits together tightly, so as to form, for breaking purposes, a single wire. A pellet striking this combination necessarily broke both circuits. A further precaution was to place an iron plate having a central opening 8 in. square in front of the screens. This was done to ensure the wires being broken by the central pellets of the charge. The face of the plate was whitewashed, and every shot that was not well centred as shown by the pattern, was rejected.

"With these arrangements for correct measurement a very large number of shots were fired. From the records of velocity so obtained the mean values were calculated. These 'means' I assumed to be a sound basis whereon to found a table of relative velocities over the ranges dealt with, namely, 10ft. (muzzle velocity), 10 yards, and 20 mètres.

"The grand average of all the series of shots fired under these conditions gave 1222ft. a second over the 10ft. range; 1160ft. a second over the ten yards range, and 1005ft. a second over the 20 mètres range.

"The velocity over the 10ft. range being for all practical purposes the true muzzle velocity, the falling off in velocity over the 10 yards range (from 1222ft. to 1160ft.) is 5·073 per cent. Knowing what the percentage of loss over the 10 yards range is for a muzzle velocity of 1222ft. a second, we may calculate the loss over the same range for any other muzzle velocity.

"For example, if it be required to find the percentage of loss for a muzzle velocity of, say, 1240ft. a second, we have the relation :

$$5\cdot073 : x :: 1222^2 : 1240^2,$$

the resistance of the air varying as the square of the velocity of the shot. That is

$$\log. x = \log. 5\cdot073 + \log. 1240^2 - \log. 1222^2,$$

and generally,

$$\log. x = \log. 5\cdot073 + \log. a^2 - \log. 1222^2,$$

being the muzzle velocity for which it is required to find the mean velocity over the 10 yards range, and x the percentage of loss with that muzzle velocity.

"From the foregoing we find that the percentage of loss with a muzzle velocity of 1240 feet a second is 5.223. Subtracting this loss, we get 1175 feet a second as the velocity over the 10 yards range.

"On such data, and in this way, the following table was calculated. To whatever objections may be raised against it on theoretical grounds I have the answer that it has stood the test of experience. The table has been in daily use at our chief testing station during the last fourteen months, in which time thousands of shots have been fired, and the records of velocity obtained, when the cartridges have been what they should be, have always agreed closely, often exactly, with the values tabulated. In using this table, it is to be borne in mind that it has been calculated for No. 6 chilled shot, of 270 pellets to the ounce.

TABLE OF VELOCITIES IN FEET A SECOND.

Muzzle.	10 yards.	20 mètres.	Muzzle.	10 yards.	20 mètres.
1000	966	885	1055	1015	919
1002	968	887	1057	1017	920
1004	970	889	1059	1019	921
1006	971	890	1062	1021	923
1008	973	892	1064	1023	924
1010	975	893	1066	1025	925
1012	977	894	1068	1027	927
1014	979	896	1071	1029	928
1016	980	896	1073	1031	929
1018	982	897	1075	1033	930
1020	984	898	1078	1035	932
1022	986	899	1080	1037	933
1025	988	901	1082	1040	934
1027	990	902	1085	1042	936
1029	992	903	1087	1044	937
1031	994	904	1089	1046	938
1033	996	906	1092	1048	940
1035	998	907	1094	1050	941
1037	1000	908	1096	1052	942
1040	1002	910	1099	1054	944
1042	1003	911	1101	1056	945
1044	1005	912	1104	1059	946
1046	1007	913	1106	1061	948
1048	1009	915	1109	1063	949
1050	1011	916	1111	1065	950
1053	1013	917	1114	1068	952

TABLE OF VELOCITIES IN FEET A SECOND—*continued*.

Muzzle.	10 yards.	20 metres.	Muzzle.	10 yards.	20 metres.
1116	1070	953	1214	1153	1001
1119	1072	954	1216	1155	1002
1121	1074	956	1219	1157	1003
1124	1076	957	1222	1160	1005
1126	1078	958	1225	1162	1006
1129	1080	960	1228	1165	1007
1131	1082	961	1231	1167	1009
1134	1085	962	1234	1170	1010
1136	1087	964	1238	1173	1011
1139	1089	965	1241	1176	1012
1142	1091	966	1244	1178	1014
1144	1093	968	1247	1181	1015
1147	1095	969	1250	1183	1016
1150	1098	970	1253	1186	1018
1152	1100	972	1256	1188	1019
1155	1103	973	1259	1191	1020
1157	1105	974	1263	1195	1022
1160	1107	976	1266	1197	1023
1163	1109	977	1269	1200	1024
1165	1111	978	1272	1202	1025
1168	1114	980	1275	1205	1026
1171	1117	981	1279	1208	1028
1174	1119	982	1282	1210	1029
1176	1121	984	1285	1213	1030
1179	1123	985	1289	1216	1031
1182	1126	986	1292	1219	1032
1185	1128	988	1295	1221	1034
1188	1131	989	1299	1224	1035
1190	1133	990	1302	1227	1036
1193	1136	992	1305	1230	1038
1196	1138	993	1308	1233	1039
1199	1141	994	1312	1236	1040
1202	1143	995	1316	1239	1041
1205	1146	997	1319	1242	1042
1208	1148	998	1323	1245	1043
1211	1151	999	1326	1247	1044

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THE RECORD GAME REGISTER.

Since the Record Game Register was printed the following additions have come to hand :—

In Essex, at Chrishall, on October 4th, 1898, on Mr. Arthur Blyth's shooting, the bag was 1067 partridges, 6 pheasants, and 67 hares. At Elmton, the next day, October 5th, 205 partridges, 5 pheasants, and 48 hares. There were only 10 drives each day, and shooting began at 10 a.m. The guns were Prince V. Duleep Singh, Baron de Pallandt, Captain Brecks R.A., Messrs. George Bowen, H. W. Blyth, R. B. Thompson, and Arthur Blyth.

This remarkable bag in a bad year was followed in 1899, even a worse year, by a bag nearly as good, as in two days 1853 partridges were killed : the best day being 1011 birds.

Mr. I. I. Pringle's shooting of snipe in South West Louisiana during 20 years is extraordinary. During one November week he killed 1414 snipe. On December 11th, 1877, Mr. Pringle killed 366 snipe.

Various statements having gone the rounds of the Press recording imaginary bags of Woodcock at Ashford, we wrote to Lord Ardilaun about it, and he on May 1st, 1899, very kindly replied assuring us that 205 birds to six guns was the best bag ever made at his place.

In Burma, General Fyche killed 252 snipe in one day.

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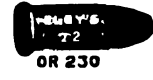


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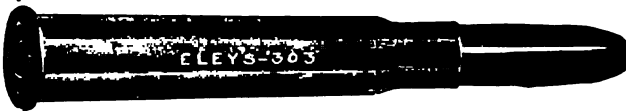
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**Gold Medal and Diplomas**, St. Petersburg Gun Trials, 1887.

## RECORDS.

**THE CHAMPION CHALLENGE CUP OF THE WORLD**, presented by *The Sportsman* Newspaper. Won by Dr. Carver, March 16th, 1881, at Hendon, and again by Captain Brewer in 1888.

**CHAMPIONSHIP OF THE WORLD CHALLENGE CUP**, Richmond, U.S.A., in 1887.

**TRIENNIAL UNIVERSAL CHAMPIONSHIP**, 2nd time, Monte Carlo, 1886.

**TRIENNIAL UNIVERSAL CHAMPIONSHIP**, 3rd time, Monte Carlo, 1889.

**Record Score at Pigeons**, 100 straight, and in the continued match 199 out of 200 and one dead out of bounds (Hurlingham Rules, 30 yards rise, and 50 yards boundary), by E. D. Fulford, at New York, November 14th, 1891.

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## MONTE CARLO.

**THE GRAND PRIX DU CASINO**, value £1,328, Monte Carlo, 1878.

**Grand Prix de Monte Carlo**, Monte Carlo, 1879.

**Grand Prix de la Marche**, Monte Carlo, 1880.

**Grand Prix de Paris**, Monte Carlo, 1884.

**Prix de Consolation**, Monte Carlo, 1886.

*Season 1891.*

**THE GRAND PRIX DU CASINO**, £791, and **OBJET D'ART**, £200 (97 Competitors).

**The Grand Prix d'Ouverture**, value £109.

**The Prix de Monte Carlo (Third)**.

*Season 1892.*

**Prix Rossini**, £198. **Prix du Cap Martin**.

*Season 1893.*

**Prix d'Ouverture**, First and Second.

**And Sixteen other Prizes.**

*Season 1894.*

**Prix Chateaubriand**. **Prix de Monte Carlo**.

**And Fifteen other Prizes**, value £700.

## MONTE CARLO—continued.

*Season 1895.*

**Prix d'Ouverture**. **Prix de Monte Carlo**.  
**And Eleven other Prizes.**

*Season 1896.*

**Second Prix du Casino**. **Prix de Consolation**.  
**And Eight other Prizes**, total value £820.

*Season 1897.*

**THE GRAND PRIX DU CASINO**, £800, and **OBJET D'ART**, £200.

**Grand Prix d'Ouverture (Second)**, £136.

**Prix de l'Adige (Divided)**, £136.

**Prix de Monte Carlo (Divided 4th)**, £84.

**Prix de la Sauve (Divided)**, £50.

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*Vide Statement of the First Lord of the Admiralty, issued Feb. 27th, 1893.*

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Also made with  
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Editor of FIELD'S Report, Dec. 14, 1895.

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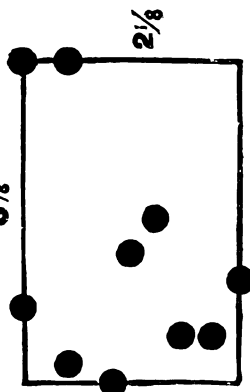


Actual Diagram.

10 consecutive shots, 5 each right and left, at 100 yards in 3½ ins. by 2½ ins., 8 of these were in 1½ in. by 2½ in.

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Easy Manipulation. Highest accuracy and Efficiency.  
The best Single Rifles for Deerstalking and Sport  
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The pull off in these rifles is as finely and perfectly  
adjusted as in the best system of gun lock.

Westley Richards & Co. have adapted a special form  
of striker to their '256 single rifles as above, which  
ensures a perfect ignition and ease of opening the block  
after firing.

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### NEW SPECIAL SINGLE RIFLES

as above, but with our patent  
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## SPECIAL SINGLE AND DOUBLE EXPRESS RIFLES,

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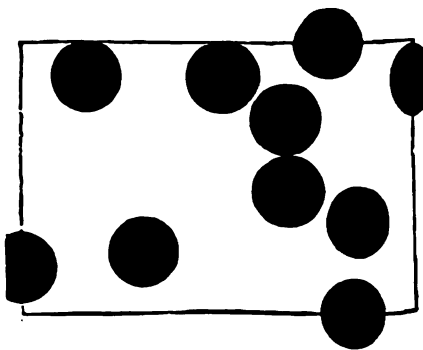
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SINGLE and DOUBLE. Regulated for  
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ACTUAL DIAGRAM.

10 Consecutive Shots at 100 yards in 4 in.  
by 2 1/2 in. 8 shots in 3 in. by 2 1/2 in.

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as a target rifle.

At 100 yards they give a force of impact 50 per cent.  
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weapon. With the nickel-covered bullet  
the penetration was enormous."—Editor of  
*Field's Report*, June 23, 1894.

# THE WESTLEY RICHARDS'

## PATENT

# Hand Detachable Locks.

Each Lock consists of the Plate & 4 main limbs, viz.: Cocker, Hammer or Tumbler, Mainspring and Sear. Each limb possesses great strength and durability.

### THE STRIKER.

This is a special feature of the Westley Richards' Hammerless Gun, being made short and strong so that it is not liable to breakage, which is such a constant source of annoyance in some systems of hammerless guns. It gives a direct blow which is of the highest importance. The long travel of the hammer urged forward by its powerful spring, acting in conjunction with this striker, always ensures freedom from miss-fires.

### THE PULL-OFF.

The arrangement of the Westley Richards' hand detachable lock mechanism, is especially favourable to a perfect pull-off, which is absolutely essential to the best shooting performance. The limbs fit solidly on the pivots of the plate, and the breadth of the sear nose and of the bents, gives a bearing of ample strength, absolute safety and smoothness. They are capable of being finely adjusted to any reasonable weight, and we guarantee clean, smooth and reliable pulls in all weapons.

### STRENGTH.

The limbs of the Westley Richards' new improved hammerless guns are stronger than any other hammerless guns with detachable locks, and the locks may be snapped off to any reasonable extent without harm, no snap caps or dummy cartridges being necessary. The gun may be put away with springs compressed, i.e., at cock, without appreciable harm.

## Westley Richards' Patent Improved Hammerless Gun, WITH PATENT DETACHABLE LOCKS.

### PRESS OPINIONS.

*Editor of "LAND & WATER," November 5, 1898.*

"We are glad to be able to compliment Messrs. Westley Richards upon an improvement of the greatest importance, especially to those who are not always within reach of a gunsmith. The appearance of the weapon is not altered in any way, nor is its working, with the exception of the division of mainsprings, as we have found by careful examination."

### EDITOR OF "FIELD'S" REPORT, September 3rd, 1898.

The new patent detachable lock plates to the Westley Richards' hammerless gun, as will be seen, do not in any way alter the form of the gun, complicate the mechanism, nor reduce its strength; and, further, the complete protection afforded to the lock mechanism from rain and dust which was one of the chief merits of the Anson and Deeley gun, is in no way interfered with. It is an improvement which entirely consists in a simplification of the old arrangement, and will be especially welcomed by sportsmen abroad, or who live at a distance from any gunsmith. This system will, no doubt, be generally adopted to the Anson and Deeley type of hammerless gun."

### EDITOR OF "FIELD'S" REPORT OF PLATE, March 11th, 1899.

## The Westley Richards' Improved Hand Detachable Locks.

"On Sept. 3 last we gave an illustrated notice and particulars of the above firm's new hammerless gun with hand detachable locks. There was only one screw in the plate which it was necessary to remove in order to take out the locks. They have now introduced a spring catch in the plate which dispenses with the use of the screw mentioned, and completes their improvements in detachment to hammerless guns. **In future the sportsman will be able to strip his gun by hand without the removal of a single pin or screw, and this is an important improvement.** It will be seen from the sketch that there is a spring catch placed at the end of the bottom cover plate, which is actuated by a spiral spring; this catch fits underneath the extractor lifter fixed in body of the gun, the plate at the other end fitting underneath the trigger plate. The spring cannot, under ordinary wear, give way, but even if it should, there would always remain sufficient strength in the coils to send the catch well home under the lifter, and the bearing which it there obtains at the one end and the locking in at the trigger plate end absolutely secure the plate in position. By pressing down the catch the plate can be lifted up, and the lock mechanism removed at will."

# WESTLEY RICHARDS' PERFECT HAMMERLESS EJECTOR GUN, WITH PATENT HAND DETACHABLE LOCKS.

FIG. 1.

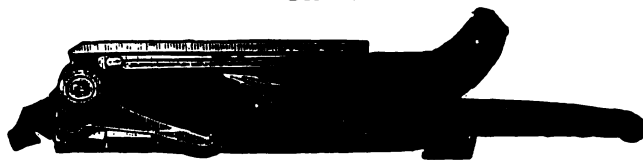


FIG. 2.

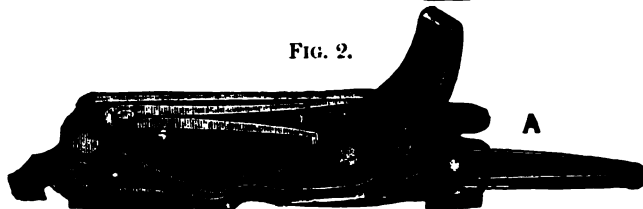


FIG. 3.

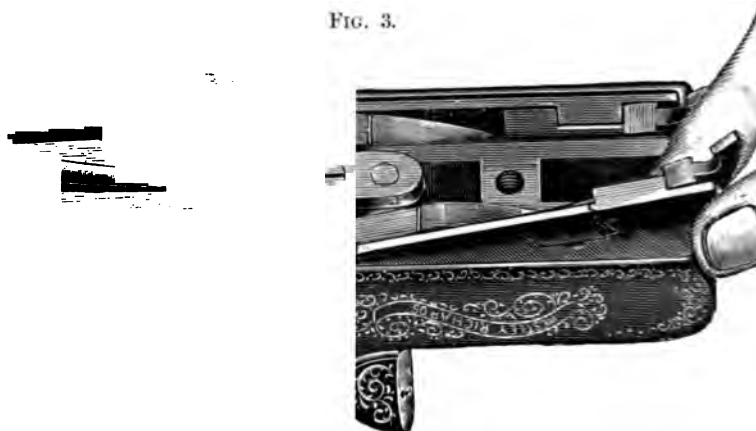


FIG. 4.



FIG. 5.



FIG. 1. Represents one of the patent detachable lock plates and lock mechanism.

FIG. 2. Is another view of the lock-plate, showing the slot at A which receives and bears against a stud within the body or action of the gun.

FIG. 3. Is a view of a double gun stock with one of the Westley Richards' patent lock-plates placed in its respective slot in the action, and the other lock-plate in the act of being inserted.

FIG. 4 & 5. Represent the bottom cover-plate with Westley Richards' Spring Catch at end to secure it in place.



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*Field* ROD AND GUN, Sept. 14, 1899.

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| The Championship at Bosnia                                      | - - -     | 1896 |
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| The Champion Stakes (Gun Club) Divided                          | - - -     | 1896 |
| The Amateur Championship of America                             | - - -     | 1897 |
| The Challenge Cup (Melbourne)                                   | - - -     | 1897 |
| The Gun Club Challenge Cup won outright (International Meeting) | - - -     | 1897 |
| The Triennial Championship (Monte Carlo)                        | - 1889 to | 1898 |
| The Grand Prix du Casino (Monte Carlo)                          | - - -     | 1898 |
| The Grand Prix du Cloture (Monte Carlo)                         | - - -     | 1898 |
| The Grand American Handicap, 197 Competitors                    | - - -     | 1898 |
| The Gun Club £100 Challenge Cup won outright                    | - - -     | 1898 |
| The Belgium £100 Cup (International Meeting)                    | - - -     | 1898 |
| The Gun Club £200 International Cup                             | - - -     | 1898 |
| The Grande Poule D'Essai (Monte Carlo), 103 Competitors         | - - -     | 1899 |
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